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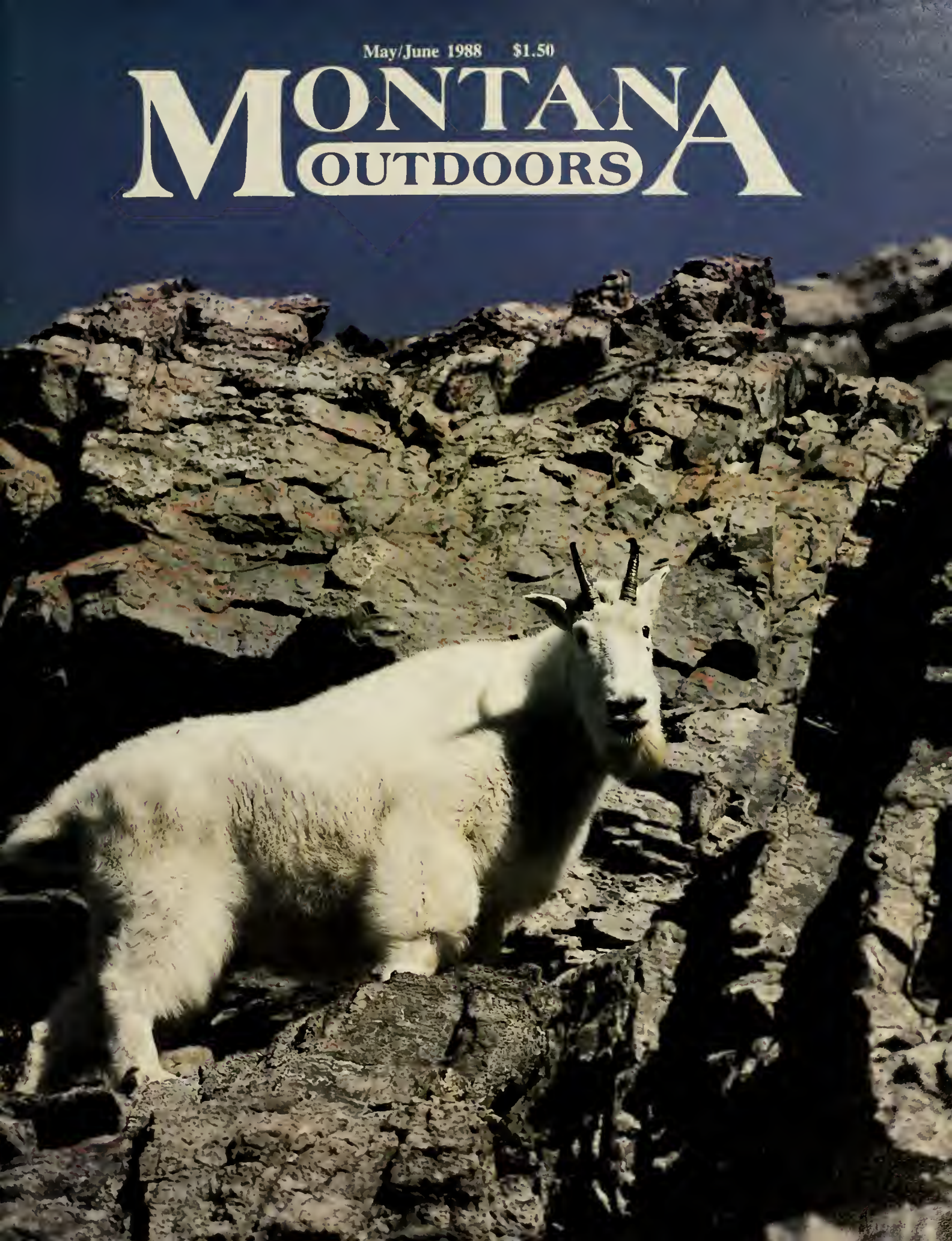

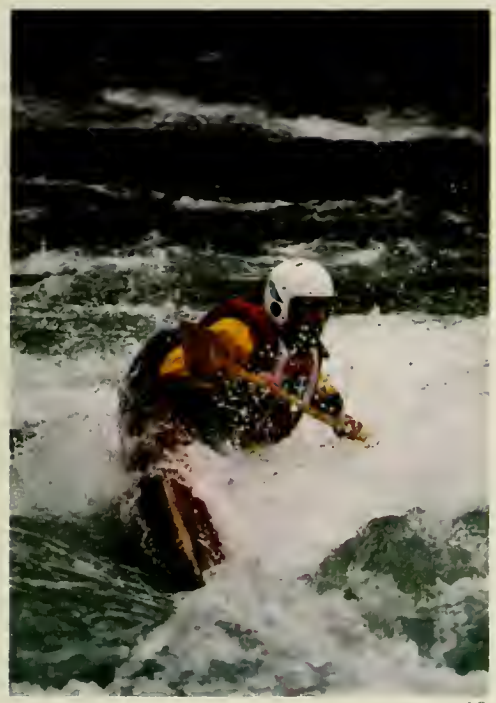

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COVERS

Mountain goats, such as the one captured for our front cover by the well-tempered lens of Conrad Rowe, are masters of hazardous terrain. They have come to symbolize Montana's wild and unexplored places, living "Life on the Edge" as they do. Lee Metcalf National Wildlife Refuge is "A Sight Worth Seeing." Evidence is provided in such eye-boggling images as Nelson Kenter's dragonfly on a cattail (inside front cover). Geese and rivers are as interwoven as goats and high places. If it were capable of doing so, Rodney Schlect's Canada goose on our back cover would join us in this issue's salute to Montana's rivers—Part One of "Here's to the Rivers!"

Masters of hazardous terrain, mountain goats along the Rocky Mountain Front have had to cope with an even more demanding challenge.

LIFE ON THE EDGE

by Gayle Joslin

WILLIAM CORR, JR

Mountain goats today are at the height of their popularity. Not only are they increasingly valued big game trophies, but also they have come to symbolize the wild, unexplored, and undeveloped frontier.

Scarcely daring to take a breath, we huddled behind a thicket of pine, fir, and buffalo berry, hoping the wind would hold off a little longer. Behind us lay the barren, upsloping ridge of Volcano Reef, and before us loomed a giant peak known as Mount Frazier. We were afraid the droning frenzy of deerflies, horseflies, and mosquitoes would compel us to give away our hiding place. Only about half a mile away, 11 goats milled about on a high, jagged point.

Mountain goats have excellent eyesight, so we crouched as motionlessly as possible, waiting for them to make the journey to their salt lick where we hid. Each goat deliberately surveyed the benches below and the vast rolling prairie to the east. An hour passed, and still the goats watched. Then, some silent signal among them triggered a determined charge from the bluff. Falling into single file, they galloped off the mountain, down a well-worn trail, and disappeared into a ravine below the lick. We had a few anxious moments before they reappeared—right in front of us. They were *so* close.

The lick extended about 50 feet and was about 40 feet wide—the same width as the net we were going to use to capture them. The backside of the net was anchored with nylon ropes affixed to four fence posts. The fence posts were topped with cylindrical iron "cannons" which would fire the net forward at my signal. I held the detonator between my knees in our hideout.

We had hoped to catch a *few* goats, but there were so many of them. All of them big, it seemed—and only two of us. Helga glanced up at me from her prone position among the ants and rolled her eyes in bewilderment. I crouched behind a stunted limber pine, peering between the branches, shaking with excitement. The detonator was still clutched tightly between my knees, my right hand on the handle.

I waited to fire the net until as many goats as possible crowded into the center of the bare lick. It was maddening, because in such limited space, the goats would not settle down. They charged and lunged, struck out with

their front hooves, slashed with their horns, and grunted expletives at each other in their bid for prime position at the lick. When the white mass of fur seemed to center itself on the bare ground, I twisted the detonator handle with as much torque as I could muster and prayed the electrical circuit was complete. A split second later, a deafening blast launched the four cannons from the four fence posts upward and outward, pulling the 2,400 square feet of net behind them. When the cannons reached the peak of their trajectory, the anchor cords jerked the flying net to the ground.

We were off and running. Three goats at the edge of the net managed to escape. Helga dived on a billy who had shaken a hind foot free. Scrambling for my clipboard, pencil, tape measure, horn guards, blindfolds, and assorted other gear, I realized we would be doing well just to get a radio collar around each neck. The eight goats we had managed to catch were, as we suspected, big—adult billies. By trapping in June, we had increased the odds of capturing males since they are the first in the population to seek out salt; females and young don't arrive until after kids are born and a couple of weeks old. Right now, however, we weren't pausing to assess the biology of the animal. We were worrying about how to unravel the tangle of fur, horns, hooves, and net.

Helga waded into the middle of the foray. Then, to my dismay, she tripped and disappeared. I grabbed the closest goat and began to pull, hoping to expose an opening through which she could escape. It worked, but in the struggle one of my fingers became entangled in the net, while simultaneously the goat launched himself sideways. As I continued struggling, my hand numbed and it dawned on me that on most normal hands, fingers protrude from the palm in a relatively parallel fashion. My middle finger was bent at an odd angle, under and across the outer two fingers.

"Helga, I think I broke my finger!"

"WHAT? Gayle, we *don't have time* for that!"

"You're right," I said. "I think we'd better start cutting the net so we can get these goats out."

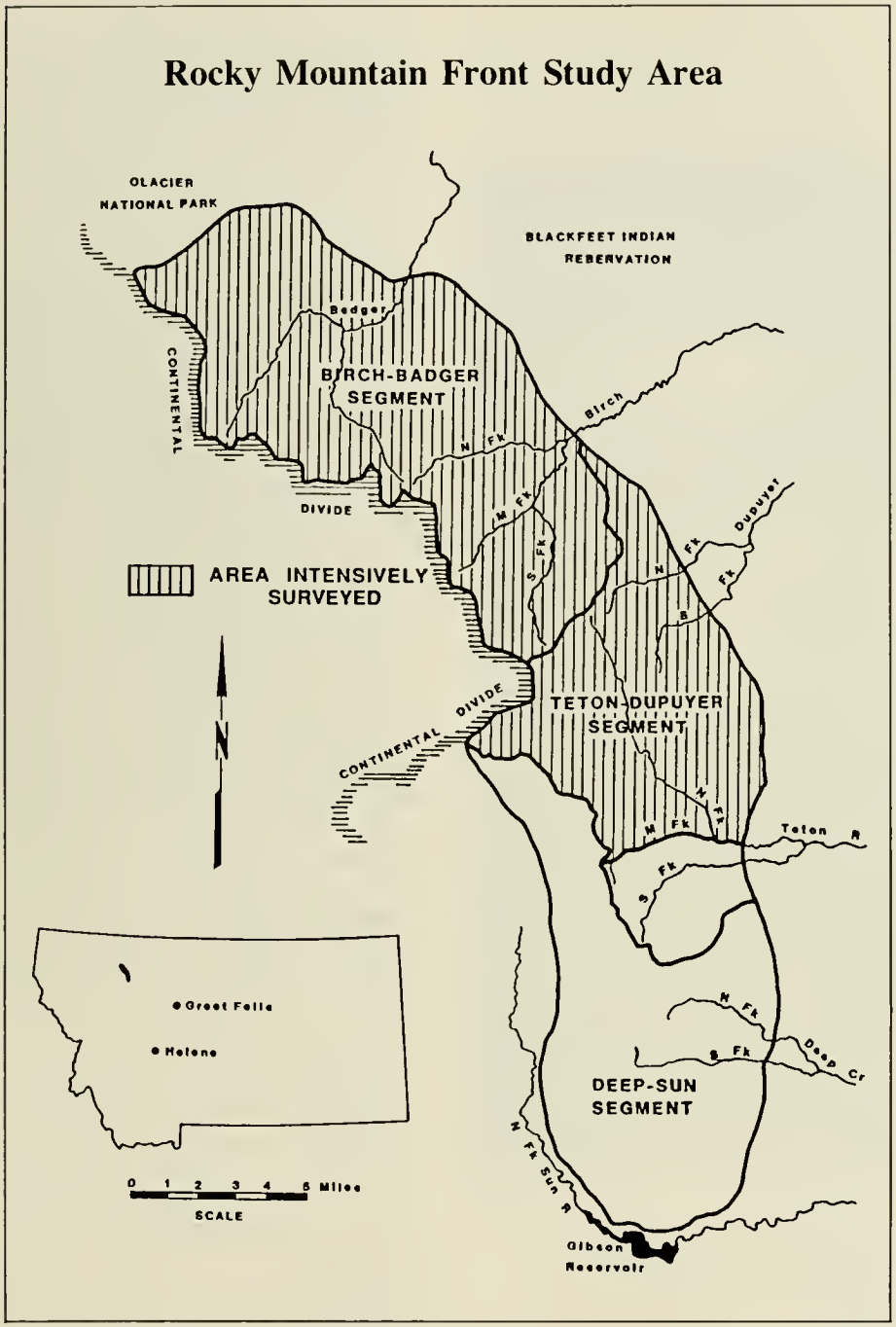
For all their daggerlike horns, powerful legs, and sharp, concave hooves, the goat is an intriguing combination of perseverance, aggression, cautiousness, and docility. More than one researcher has commented on the latter trait because it seems to contradict the others. When a goat senses that it is in a dangerous situation, it often does nothing. For example, when goats are trapped, they frequently "play dead." More than one biologist has been unnerved by a limp, apparently lifeless goat. If left alone and after a time of quiet, the "dead" goat will raise its head, survey the surroundings, and if it perceives no immediate danger, jump to its feet, and take off at a gallop.

In research projects such as this one, it's helpful if you can trick a goat into

GAYLE JOSLIN

Mount Frazier is part of the Rocky Mountain Front's familiar profile. The mountain provides security to dozens of mountain goats that use the Volcano Reef mineral lick. Goats captured at the lick were blindfolded, fitted with horn guards to protect the researchers, measured, and then released wearing radio collars.

WAYNE ARNST



playing dead—you must lie across the animal, creating a feeling of constraint. With seven goats still in the net, this wasn't possible, so we hacked a hole in the net large enough to pull one goat through. Then we laid on it long enough to secure the collar, record the radio frequency, and write down the animal's sex.

By the time we got to the last and largest animal, his patience had run out. No amount of direct body pressure was about to subdue him. In fact, he didn't intend to wait around for a collar. As we spread the collar to slip over his neck, he gained his footing. A bolt, washer, and lock nut were supposed to secure the collar's base, but Mr. Goat would have none of it. As a result of an old injury, this goat had only one horn, but it was a sturdy handhold. Helga, as persistent as the big billy, held onto the horn, hooked her heel over the goat's flank, grasped his stringy mane with her other hand, and went bounding away, clinging to the goat's side in Annie Oakley fashion. I think she would be dangling from that old billy yet if I hadn't yelled for her to let go. Today—five years later—the boltless plastic collar remains around that goat's neck.

We began studying mountain goats along the Rocky Mountain Front because we knew very little about the herd and because disturbance and development of goat habitat in other portions of their range has often resulted in population declines. Our objective was to determine how mountain goats respond to habitat disturbance and to develop guidelines to help reduce impacts to goats and their habitat.

Mountain goats are among the least understood of North American big game animals because they generally inhabit remote, inaccessible terrain. Opportunities to study them have been limited, logistically difficult, and expensive. There has been little incentive for understanding the needs of mountain goats since their existence seemed secure. Compared with other big game, interest in and demand for goats until recently was relatively low. These circumstances have changed, not only in Montana, specifically along the Rocky Mountain Front, but throughout the mountain goat's range.

Mountain goat country is often perceived as the last vestige of an unexplored, undeveloped frontier, but it is not as remote and inaccessible as it once was. Unfortunately, where security has been reduced, mountain goat populations have generally declined.

Even under the best conditions, a mountain goat's existence is tenuous. Although they are adapted to survive in the toughest country, they are able to cope with little else other than the rigors of the country. If the country is undisturbed, they thrive. But mountain goats have a serious behavioral failing: They are extreme creatures of habit. Once a goat establishes a pattern of daily and seasonal movements, it rarely, if ever, deviates from that pattern. This means a goat is extremely vulnerable to danger if its normal haunts are altered in any way.

For example, a new trail or road intersecting a goat's normal travel route will not dissuade it from using the site,

even though the goat is exposed to more danger. The Walton Goat Lick on the southern edge of Glacier National Park is a good example. The Montana Department of Highways built an underpass for mountain goats under U.S. Highway 2 to alleviate a long-time traffic hazard of goats crossing the highway on their way to the lick. Before the underpass was built, goats crossed the highway even if cars and trucks were speeding by.

Possibly the more serious concerns, the ones with broader consequences, result from the physiological stress the goat experiences when confronted with a change in its environment. Although not much research has been done on the effects of stress on goat physiology, researchers have studied it extensively in mountain sheep and other wildlife. Research from Alberta shows that even if an animal does not respond outwardly to disturbance, it does not necessarily mean the animal is not responding internally through increased adrenalin output, raised heart rate, or other reactions. Research also shows that if stress is repeated or prolonged, resistance to infection and disease may decrease and reproduction may be impaired or completely fail.

In 1981, extensive oil and gas exploration was initiated along the Rocky Mountain Front. The Department of Fish, Wildlife and Parks knew that goat populations in other areas had not prospered when development disturbed remote country. Department officials believed that tracking the fate of mountain goats along the Front would provide a unique opportunity to determine more precisely how a mountain goat population reacts to such developments. Although researchers weren't sure that problems would surface, experience from other areas suggested that possibility. Energy exploration of the Front has not involved much new road construction, but helicopters have been used extensively to move people and seismic equipment.

Gas and oil exploration along the Front in the 1980s consisted primarily of helicopter-based seismic testing. Seismic testing involved any one of a number of techniques which measure the speed of shock waves. One technique involved "thumper trucks" manually generating shock waves by pounding on the ground; a more common way of generating shock waves is by detonating explosives either on the earth's surface or in holes drilled for that purpose. The shock waves move down through the earth's crust and are reflected to the surface at differing speeds when they encounter various densities of underlying earth. Surface charges have generally been used in the roadless country of the Front.

Each type of seismic operation requires a series of support activities implemented by individual crews. The amount of human activity associated with a seismic line run in roadless mountainous country varies according to the terrain, weather, and the company conducting the work. About 20 people are usually involved: survey, layout, shooting, recording, and trashing crews. Two helicopters are generally used for transporting crews and equipment. For each mile of seismic line shot, at least eight miles of helicopter flying is required.

A seismic line consists of about 20 bags of explosives, each draped over a wooden lath pounded in the ground. The explosives are detonated simultaneously, producing a tremendous explosion. Although the explosions are themselves a disturbance, the disruption caused by the helicopters is also a concern. Helicopters may be especially disruptive to mountain goats since aerial predators (eagles) are the goat's most significant natural enemy.

Although seismic activity was sporadic during the 1960s and '70s, it increased 37-fold during the early '80s. Over 200 miles of seismic lines were shot each year between 1981 and 1984.

Mountain goats along the Front are distributed in a 500-square-mile area, roughly from the Sun River north to Glacier National Park. In the center of this area is the Mount Frazier mineral lick. Between 1979 and 1983, we radio collared 23 goats, fitted eight with color-coded neck bands, and ear-tagged four. Segments of this study continued until 1987.

We flew the study area every 10 days to locate marked goats until 1985. In addition, we made aerial surveys each June through 1987 to determine goat numbers and production. We learned that the goat herd had declined, and this decline was related to failing productivity.

Closely monitoring radio-collared female goats allowed us to grasp what was happening in the population as a whole. During the study, the 11 radio-collared females produced only 18 young. However, based on normal reproductive performance of mountain goats, they should have produced 42. Of the 18 kids born, six died before their first birthday, the fate of four others was undetermined, and only eight survived. This dramatic decline in kid production and kid survival resulted in a lack of reproducing females coming into the population. So, the population declined. Intensive June surveys indicated that the goat population declined about 35%.

Why did this occur? And was seismic activity related to this decline?

The Rocky Mountain Front gave us the opportunity to look at two areas where goats responded differently to human activity. One area extended from Glacier National Park south through Birch Creek (see map). The other area extended from south of Birch Creek to the Teton River. The area south of Glacier, termed the Birch-Badger area, is pristine and nearly devoid of human-related activities. In contrast, the southern area, called Teton-Dupuyer, has had a history of human-related activities, many involving year-long mechanized access.

Both areas had high levels of seismic activity from 1981-84. We found that the Birch-Badger population segment declined, but not to the degree that the Teton-Dupuyer population did, and it improved more quickly once seismic activity abated.

Initial differences in human use between the two areas, coupled with the dramatic increase in energy exploration, probably accounted for different responses in the goat populations. In both areas, kid production dropped markedly as exploration activity peaked. In the Teton-Dupuyer area, both kid production and adult female numbers failed to recover quickly as disturbance abated. In contrast, in the Birch-Badger segment, the number of adult females declined less dramatically and the kid portion of the population began to rebound more quickly once energy exploration ceased.

The relative absence of long-term

human disturbance in the Birch-Badger area probably accounted for the goats' increased resilience; the long-term human disturbance in the Teton-Dupuyer area appears to have taken a toll on the ability of the mountain goat population to sustain itself.

In summary, it appears that seismic activity was responsible for goat declines along the Rocky Mountain Front. This decline was more evident in the Teton-Dupuyer area where human activities were already occurring, but the goat population declined even in the undisturbed Birch-Badger area.

As we contemplate the future of these rugged, yet obviously fragile, creatures, the goats linger in the wind on the pinnacle ridges of the northern Rockies. In all seasons, mountain goats are tough enough to sustain themselves in an environment so severe that other animals leave or dig in and hibernate for the winter. Yet, in other ways, they are so sensitive and fragile that human disturbance is capable of sending the whole population toward oblivion.

Research along the Rocky Mountain Front has demonstrated that beyond the travails imposed by Mother Nature, mountain goats have trouble tolerating certain of man's activities. The goats along the Rocky Mountain Front declined not because of direct mortality, but because of more subtle, insidious pressures that lowered survival of the young, compromised the reproductive function of adult females, and lingered long after the disturbance had ceased.

The mountain goat lives on the edge of survival. That's how it's always been, and little room exists for human-induced stress. The hard fact is that at some unknown but relatively minor level, human disturbance in mountain goat habitat results in declining goat populations. This has been repeatedly displayed across North American goat country. Even the pristine Birch-Badger area of the Rocky Mountain Front could not sustain its goat population in the face of a four-year disturbance.

They are not the only creatures facing pressure from the modern-day world. Yet without mountain goats, the wind would sing a lonely and mournful song across Montana's peaks and rocky ridges.■

JOYCE CLARKE TURVEY

Mountain goats are highly social animals that pass along knowledge of traditional movements to their offspring through example. Even when confronted with danger, goats will not deviate from established routines. Vulnerable to circumstances out of the ordinary, mountain goats may suffer from human disturbance.

Part Of The Natural World

Bluebird

by Dennis Flath
illustrated by Diana Haker

In today's changing world, the value Americans place on plant and animal life has more than held its own. More and more, we look to Montana's nongame wildlife as part of the natural world, as a contributor to the quality of life cherished by Montanans and visitors to the state.

With this realization, the 1973 Montana Legislature authorized creation of a Nongame Wildlife Program within the Department of Fish and Game (now the Department of Fish, Wildlife and Parks—DFWP). Unfortunately, the Legislature did not authorize funding, and lack of adequate and appropriate revenues has dogged the program.

Nationally, income tax checkoffs are a popular way of funding nongame programs; however, Montana's small number of taxpayers provides only limited opportunity. The result has been declining revenue for the nongame program—from $35,427 for tax year 1983, to $24,572 for tax year 1986. Even so, the average donation is increasing—for tax year 1986, it hit $7.92, among the highest in the nation.

The department continues to commit other funds to the nongame program. Those funds come partly from hunting and fishing license fees and partly from federal grants-in-aid under the Pittman-Robertson (P-R) program. Checkoff revenue is used for research and education, while P-R money is used for surveys and management-oriented activities, which the balance of this article summarizes.

Public Needs

Because of increasing demands on the nongame program, the DFWP decided to conduct a public survey to determine how the public sees the program's needs and what the public expects from it. The survey was conducted earlier this year, and results will appear in a later installment of "Nongame News." Evaluation of opinions will help establish program direction for the coming fiscal year—a direct link between the opinions of Montanans and activities approved for the nongame program.

Bluebird Trail

Personnel in Montana's Nongame Wildlife Program coordinate participants in the Montana Centennial Bluebird Trail project. In 1989, Montana will celebrate 100 years of statehood. To help celebrate, citizens across the state are joining together to build a Centennial trail of bluebird nest boxes. Participants will place nest boxes, four per mile, along Montana Highway 200, which winds through the heart of the Big Sky country. While these boxes attract bluebirds, they also benefit other native species of cavity-nesting birds. Construction costs are minimal, and people from Heron to Sidney can join in the effort to attract bluebirds back to Montana.

Bluebirds benefit agriculture by consuming troublesome insects. But possibly more than that, their presence alone contributes to the quality of life in Montana.

Nongame Symposium

Begun in 1985, the annual Nongame

Symposium draws together researchers, managers, and others interested in nongame wildlife (see this issue's "Nongame News" for a report on the 1988 symposium). This year's symposium was conducted in Lewistown; previous symposia were conducted in Kalispell (1987), Billings (1986), and Missoula (1985).

The Nongame Wildlife Program is the catalyst for organizing and producing this annual event. The symposium committee is drawn from those interested in nongame wildlife who are willing to accept responsibility for the symposium. The gathering's tremendous success bears testimony to the attractiveness of nongame wildlife and the dedication and interest of participants and attendees.

Raptor Survey Route

The raptor survey route system is a series of vehicle routes, surveyed each spring, which were set up to provide information about raptors. Participants from various resource agencies and volunteers from the private sector have driven the routes and conducted the surveys since 1977. One route is located in each of the state's 47 latilongs (a "latilong" is simply a block of land one degree latitude by one degree longitude–in Montana, roughly 45 to 70 miles).

To reduce effects of weather and other variables, counts are grouped in three-year segments and the numbers averaged. These three-year averages of the total number of raptors seen per thousand miles of route steadily increased—from 198.60 in 1977-79, to 315.54 in 1982-84, followed by a decline to 292.45 in 1985-87. Peak numbers were recorded in 1982 and 1984.

Eleven years of observations enable researchers to detect trends. Most species display generally stable or increasing populations. Increases are most apparent for turkey vultures, red-tailed hawks, golden eagles, and ospreys. Populations of northern harriers and kestrels have declined, probably because these birds are sensitive to drought which has plagued eastern Montana in recent years.

Bald Eagles

As an active participant in the interagency Montana Bald Eagle Working Group, the nongame program staff is responsible for compilation and synthesis of information on statewide nesting surveys. Montana had 60 occupied bald eagle nests in 1987; when 1988 surveys are complete, we'll probably see even more. Last year, researchers knew what happened to 58 of those occupied nests: 41 (71%) were successful, and 77 young were fledged. This is excellent productivity for the species and suggests a bright future for the bald eagle in Montana.

The nongame program staff has also helped to develop management recommendations to assist land managers and private landowners who have bald eagles nesting on land they own or manage. These recommendations have helped to secure nesting habitat for our national symbol.

Program Coordination

Many agencies of both state and federal government have responsibilities for natural resources. To some extent, their programs invariably include consideration of nongame wildlife. The DFWP nongame position serves as a focal point for coordination and liaison of these many programs. With the welfare of 83% of our wildlife species at stake, close coordination is a must. Programs are dovetailed to maximize efficiency while trying to minimize conflict and duplication of effort. This results in a unified approach to nongame wildlife conservation which benefits both the animals and those who appreciate them.

In the private sector, groups such as Audubon, the National Wildlife Federation and its state affiliates, and others are intensely interested in nongame wildlife. Audubon, for example, sponsors a number of ongoing activities related to wildlife conservation. The nongame program staff often acts as a facilitator or cooperates in some of these activities. Information generated by such organizations is often useful to the nongame program, so continued contact is important. An example is

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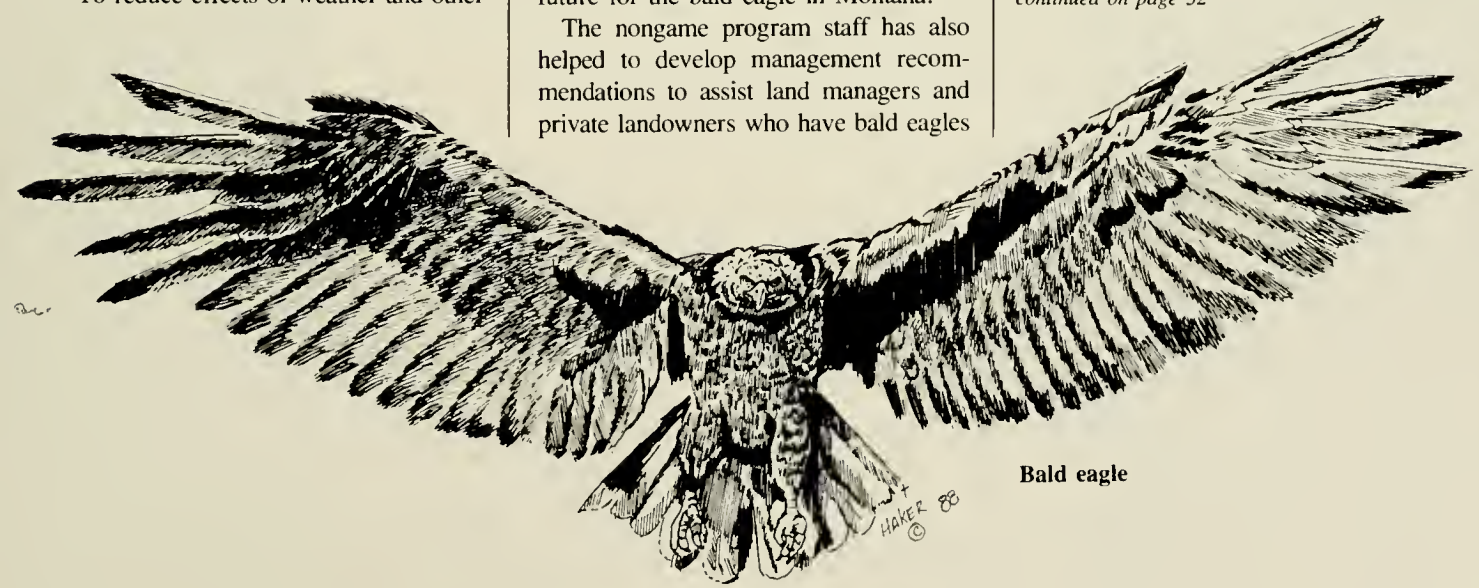
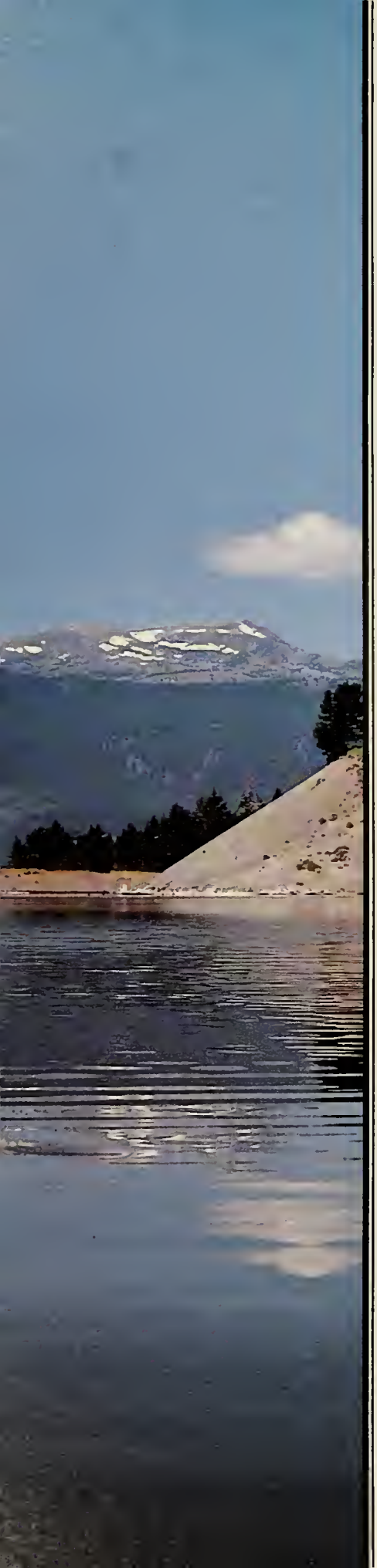


Bald eagle



The New Rainbows

by Dick Vincent

It has been a good day of fishing on your favorite trout lake and now you are examining your catch. You may not realize it, but some of the rainbow trout in your creel may be part of a new trout management program. This program involves introducing new strains of rainbow trout into some cold-water lakes and reservoirs where they were not previously found. They may look like any other rainbow trout you've ever caught, but they aren't.

What do we mean by a rainbow trout "strain"? Like fishermen, not all rainbow trout behave the same way or eat the same food. Different strains of rainbow have evolved, utilizing different sources of food and different types of habitat; therefore, some may be more successful than others in a particular lake or reservoir.

Rainbow trout are not native to most of Montana and were introduced in the late 1800s or early 1900s. These early introductions were made up of mixtures of several wild strains native to California. Most of the original sources were not well documented, so it is uncertain which strains we actually received. Eventually, self-sustaining wild rainbow trout populations developed from these plantings wherever habitat was suitable.

Before the 1950s, trout stocked in lakes and reservoirs in Montana were derived from these wild trout populations. Each spring, eggs were obtained from rainbows caught in spawning traps on tributaries to such lakes as Harrison, Hebgen, Ennis, and Georgetown. Once the eggs were collected from the spawners, they were taken to hatcheries where they were then incubated until hatching. The young rainbow trout were raised to stocking size (one to three inches) and then were planted around the state.

Beginning in the mid-1950s, two factors began to change

Wild strains of rainbow trout may lead to better fishing in some cold-water lakes and reservoirs. (photo: AL TROTH)

Montana's stocking program. Information gathered by fisheries personnel showed that the larger the trout was when stocked, the better its chances for survival. To produce these larger trout, the Department of Fish, Wildlife and Parks (DFWP) began development of a domesticated broodstock which could be kept in department hatcheries for spawning. This domesticated strain (called the Arlee rainbow trout) was gradually altered so that it spawned in late fall or early winter instead of early spring, the traditional spawning time of wild rainbow trout. This meant that rainbows hatched in November or December could be grown to three to six inches by late May or early June when most stocking was done.

Having our own broodstock in hatcheries also made the egg source more reliable, since spawning runs of wild rainbow trout are somewhat unpredictable. The Arlee rainbow solved the planting size and egg source problems, and quickly became a favorite of lake and reservoir fishermen because of its fast growth and catchability.

Although the Arlee strain continues to provide a major segment of rainbow trout fishing in reservoirs, there are some trade-offs. First, it does not appear to spawn and reproduce in the wild, and second, although it grows very rapidly, it has a considerably shorter life span (1 to 3 years) than its wild counterparts, which can live up to 8 years. In an effort to create rainbow populations that will reproduce in the wild and live longer than the Arlee strain, we embarked on a program in 1977 with two major objectives: (1) to reintroduce strains of wild rainbow trout in lakes and reservoirs where spawning habitat was available to support self-sustaining populations, and (2) to find strains better suited to certain lakes and reservoirs, even if their populations will never be self-sustaining. Four wild strains are currently being used for such introductions: (1) the Lake DeSmet rainbow from Wyoming, which is primarily a plankton (tiny aquatic organisms) feeder and seldom feeds on other fish; (2) the Eagle Lake rainbow from California, which feeds on plankton and insects when small but switches to the Tui lake chub as it grows larger (this lake chub is similar to the Utah chub found in reservoirs of the upper Missouri drainage); (3) the McConaughy Lake rainbow from McConaughy Lake, Neb., which reputedly feeds on fish when it reaches larger sizes; and (4) the Kamloops rainbow from British Columbia, which feeds primarily on kokanee salmon.

In deciding how to achieve the objectives outlined above, we looked closely at characteristics of the rainbow strains and at features of a number of cold-water lakes and reservoirs. In the case of the first objective, we needed water bodies with suitable spawning tributaries and a past history of self-sustaining rainbow populations. To meet the second objective, we needed to match available food supply with the selected strain's feeding habits. The following sections discuss progress to date with this new aspect of our cold-water lake and reservoir management program.

HARRISON (WILLOW CREEK) RESERVOIR

Since Harrison Reservoir was one of the primary sources of rainbow trout eggs during the 1940s and '50s and had a good self-sustaining rainbow trout population, it was logical to choose it as the first reservoir for rainbow strain evaluation. Located near the town of Harrison 40 miles west of Bozeman, the reservoir's primary spawning tributary is Willow Creek, where the original rainbow spawning trap was located. After the Arlee strain was developed, the need for this trap disappeared. From the mid-1950s through 1976, all stocking of Harrison Reservoir was done with the Arlee rainbow strain.

Four wild rainbow strains are being introduced to selected Montana waters: the Lake DeSmet rainbow from Wyoming, the Eagle Lake rainbow from California, the McConaughy Lake rainbow from Nebraska, and the Kamloops rainbow from British Columbia.

AL TROTH

During the 1970s, anglers began to complain that the rainbow trout fishing was declining and they were catching few large rainbow trout compared with the past. Gill net sampling by the department during this period supported this complaint; populations were low and few fish exceeded 13 inches in length. During the spring of 1976, a spawning trap placed in Willow Creek captured fewer than 50 adult rainbow trout spawners.

We decided the DeSmet rainbow trout strain was the most logical choice for reintroduction, since it is known to be a good plankton feeder and plankton is the main food source in this lake. In 1977, we obtained our first 100,000 DeSmet Lake rainbow trout eggs from Wyoming. These eggs were taken to

the Bluewater Hatchery near Bridger and hatched; when the fry reached two inches, they were stocked in Harrison Reservoir. An additional 100,000 DeSmet fry were stocked in the reservoir during each of 1978, 1980, and 1981, with a final 40,000 stocked in 1983.

To evaluate the success of this program, a new spawning trap was constructed in Willow Creek so that spawning DeSmet rainbow could be counted, weighed, measured, and compared with those from past runs. Gill netting was also done in the reservoir so that rainbow densities before and after the DeSmet introduction could be compared. In 1982, five years after the first introduction, the spring rainbow spawning run totaled 608; by 1987, nearly 3,500 male and female spawners were counted at the spawning trap. These fish averaged 19 inches in length and 2.5 pounds in weight. Gill net samples from the reservoir showed similar increases. The population has depended on natural reproduction since 1983; of the 3,500 spawning rainbow trout present in the 1987 run, more than 90% were produced naturally in the tributaries and then recruited to the lake.

Presently, Harrison Reservoir is being managed as a brood lake for the DeSmet rainbow strain, with up to one million eggs being taken annually. It is our only source of the DeSmet strain at present, since Wyoming can no longer supply us with eggs. We allow enough spawners to pass the trap each year to maintain an adequate supply of young rainbows in the reservoir. We estimate that nearly 3 million eggs are laid in the tributaries each spring. To provide additional protection for the rainbow spawners, angling restrictions have been placed in effect. Regulations for 1988-90 will allow only three trout to be taken daily. The Willow Creek Arm, where spawners concentrate in the spring, is closed from March 1 to the third Saturday in May each year.

HEBGEN RESERVOIR

Hebgen Reservoir, on the Madison River near the town of West Yellowstone, was considered another excellent choice for evaluating new strains of trout. Hebgen has eight tributaries with adequate water volumes to potentially support rainbow spawning runs. As at Harrison Reservoir, the DFWP maintained tributary spawning traps in the 1940s and '50s to obtain both rainbow and brown trout; these traps were located on the Madison River, South Fork of the Madison River, and Grayling Creek. Although no records of those early spawning runs were kept, wild rainbow trout were present in large enough numbers to trap. Surveys of spawning rainbow trout in the mid-1970s, however, found only a few fish remaining.

Two rainbow trout strains are currently being stocked in Hebgen: the Eagle Lake and DeSmet strains. Stocking of the Arlee strain was discontinued in 1980. McBride Lake cutthroat trout, which have been stocked in Hebgen since 1979, have shown little promise for establishing a self-sustaining population, so stocking has been discontinued. Although this strain has done exceptionally well in some high-elevation lakes, after nine years of stocking in Hebgen, gill net surveys have shown only moderate survival and no significant recruitment from the limited spawning taking place in Grayling and Red Canyon creeks.

The Eagle Lake rainbow strain was first introduced to Hebgen Reservoir in 1983, and the DeSmet in 1986. It was hoped that the Eagle Lake strain would feed on the large population of Utah chubs in the reservoir, and that the DeSmet strain would utilize the plankton population. While neither strain has been in Hebgen long enough to completely evaluate its success, preliminary information taken in 1987 looks promising. Spawning Eagle Lake rainbow trout were found in all eight tributary streams sampled and were present in most of the gill nets set during September 1987. No DeSmet rainbow trout were old enough to spawn in 1987, but large numbers were found in the September gill net sets.

Gill net surveys have been conducted in Hebgen since 1971, with pre-1980 information showing less than one rainbow trout per gill net set. Even though no rainbow trout were stocked in Hebgen Reservoir from 1980 through 1982, some increases in wild rainbow trout were measured, as the number per net set in the spring of 1983 increased to two. Eagle Lake rainbow were stocked in 1983, '84, '86, and '87, while DeSmet were stocked in the fall of 1986 and '87. The September 1987 gill net survey showed eight rainbows per set, a substantial increase over any previous sample. Of these eight rainbows, an average of four were from the original Hebgen wild rainbow trout strain, three were DeSmet rainbows, and one was an Eagle Lake rainbow. Since the rainbow trout introductions are so recent, the degree of success is uncertain. We still do not know if either the DeSmet or Eagle Lake strain will produce enough young fish to supply the reservoir, but the wild rainbow strain still living in the reservoir has increased significantly, suggesting that a wild rainbow trout population can exist there. As in Harrison Reservoir, a reduction in the creel limit (from 10 to five trout) has been initiated to hasten rainbow trout recovery.

CLARK CANYON RESERVOIR

Clark Canyon Reservoir, the third reservoir selected for the strain evaluation studies, is located on the Red Rock-Beaverhead River about 10 miles west of of Dillon. The reservoir has a rich plankton food source, and the Red Rock River has excellent potential as a spawning tributary. There appears to be ample spawning gravel as well as adequate water to rear young rainbow. Since the completion of Clark Canyon Dam in 1965, no significant self-sustaining population of rainbow trout has been found, although annual plants of Arlee and DeSmet rainbows have been made since 1983 (except 1985, when the DeSmet strain was not stocked).

Although results of the DeSmet rainbow introduction are not yet conclusive, the number of rainbow trout found in gill net samples increased fourfold from the 1980-84 period to 1987. This increase in rainbow trout numbers was the result of DeSmet rainbow survival. Although spring electrofishing on the Red Rock River in 1986 and '87 showed that enough DeSmet rainbow survived to produce a significant spawning run, it remains to be seen whether there will be sufficient

reproduction to establish a self-sustaining population. DeSmet rainbows in Clark Canyon Reservoir have already reached larger sizes than those found in Harrison; maximum size is near five pounds in Clark Canyon, versus 3.75 pounds in Harrison. Arlee rainbow, however, continue to make up a portion of the rainbow harvest in Clark Canyon and commonly grow to three to five pounds.

OTHER LAKES AND RESERVOIRS

Strain evaluation studies are being conducted in other lakes and reservoirs in Montana, but most of these studies are in their early stages with no conclusive results. The following section lists the lakes where strain evaluation is presently being carried out.

Lake DeSmet rainbow—(1) Wade Lake near West Yellowstone in Madison County, (2) Ennis Lake on the Madison River near Ennis, (3) Canyon Ferry Reservoir on the Missouri River near Helena, (4) Smith River Reservoir near Great Falls, and (5) Beaver Creek Reservoir near Havre.

Eagle Lake rainbow—(1) Ennis Lake; (2) Canyon Ferry Reservoir; (3) Beaver Creek Reservoir; (4) Grasshopper Reservoir near Chinook; (5) Eureka Reservoir, Ackley Lake, Bair Lake, and East Fork Spring Creek Reservoir near Great Falls; (6) Woods Lake near Whitefish; and (7) Haypress Lakes in the Gravelly Mountains south of Ennis.

McConaughy rainbow—(1) Deadman's Basin near Billings, and (2) Holter Reservoir on the Missouri River near Helena.

Kamloops rainbow—(1) Ennis Lake and Georgetown Lake near Philipsburg.

Harrison Reservoir is managed as a brood lake for the DeSmet rainbow strain. A spawning trap constructed in Willow Creek allows collection of up to 1 million eggs each year.

RON AASHEIM

FUTURE OF COLD-WATER TROUT MANAGEMENT

What does this program mean to Montana's anglers? Will all of our cold-water lakes and reservoirs be converted to self-sustaining trout populations and will we abandon strains unable to reproduce in the wild? Probably not, because most of these waters are incapable of supporting self-sustaining populations. However, the wild strains may provide a better option for some waters than one of the domesticated strains.

In general, we can divide cold-water lakes and reservoirs into three categories: (1) those capable of supporting self-sustaining wild trout populations; (2) those capable of providing some reproduction, but inadequate to maintain a quality fishery without supplemental stocking; and (3) those with no potential for any natural reproduction. To have a self-sustaining wild trout population, a lake or reservoir must have adequate spawning streams or springs with good flows of high-quality water. Flows must not only be adequate during spawning, but during hatching and rearing.

Reservoirs or lakes in the first category—those capable of supporting a self-sustaining wild trout population—would be stocked with enough wild rainbow trout to establish a self-sustaining population. The selection of a strain or strains would be based on quantity and type of food supply, water temperatures, and water chemistry of the lake. Once self-sustaining populations are established, stocking would cease.

Category two—reservoirs or lakes with only limited potential for self-sustaining trout populations—could be managed either with wild strains alone or wild and domesticated rainbow strains, depending on which trout are best adapted to the particular body of water. Some sustained stocking of the chosen strain would be necessary to provide an adequate trout fishery for anglers.

Category three—reservoirs or lakes that cannot support self sustaining trout populations due to lack of spawning areas or periodic winter kills—would be managed through annual stocking of domesticated rainbow strains. One of the wild strains might be used in a few instances, where it appears to be the best adapted.

The addition of these wild strains of rainbow trout shows great promise for improving Montana's cold-water lake and reservoir program. Managers will have more options for matching trout strains with existing food supplies and lake conditions, and the result will be larger fish and better fishing for Montana's anglers.■

Remembering Arnie Foss

Arnold "Arnie" J. Foss, wildlife manager for the Department of Fish, Wildlife and Parks southwestern region (Region 3), died in Bozeman on March 13 after a short illness. He was 55.

Arnie began his career as a professional biologist in 1962 as the department's game management biologist in north central Montana (Region 4). He was moved to Billings in 1964 and served as the Region 5 game manager until 1970. He then moved to Bozeman where he served as Region 3 wildlife manager until his death.

Arnie's tenure was marked by many accomplishments. He advocated increased harvests of elk migrating out of the Sun River Game Preserve and Yellowstone National Park. He promoted the transition from general, either-sex elk seasons to antlerless elk permits in Region 3. He developed the regular pattern for annual late elk hunts in the Gallatin and upper Yellowstone. He introduced branch-antlered bull elk seasons in southwestern Montana. Arnie's innovations in elk management have resulted in a dramatic increase in elk herds and elk hunting opportunity.

Two major research studies, on mule deer in the Bridger Mountains and elk in the Gravelly-Snowcrest Range, would not have been possible without his support and input. Both were an integral part of his big game management program.

Other major accomplishments centered on habitat acquisition and management. Foss was a strong advocate of permanently securing big game winter ranges by public ownership. He took special pride in acquisition of the Blacktail, Dome Mountain, and Mount Haggin Wildlife Management areas. He initiated range improvement on some of these areas by use of carefully regulated rest-rotation grazing systems. He was innovative in leasing winter range for mule deer on private land in the Bridgers.

Arnie and "his crew," as he affectionately referred to his wildlife biologists, pioneered the quota system for harvests of male and female mountain lions in southwestern Montana.

A native of Ladysmith, Wisconsin,

Arnie Foss

Arnie earned B.S. and M.S. degrees in fish and wildlife management from Montana State University. He served in the U.S. Air Force from 1951-55, and was stationed in Mississippi, Korea, and Malmstrom Air Force Base in Great Falls.

Arnie actively supported his professional organization, The Wildlife Society, which included both the Montana Chapter and the Northwest Section. He served as the chapter's president in 1969. He was also active in Bozeman's Little League baseball program and drove the bus for the American Legion's Bozeman Bucks baseball team.

Foss never forgot that he served hunters who supported sound game management with their hard-earned license dollars. His death is a major personal and professional loss to those who lived and worked with him.

He is survived by his wife, Dorothy, of Bozeman; a daughter, Marcia, of Sunnyvale, California; two sons, Douglas and Eric, both of Bozeman; his father, Steve, of Bozeman; and six sisters, Florence Larson of Ledger; Marge White of Salt Lake City; Lorraine Arthur of Thompson Falls; Mary Chambers of Portland; Jessie Wright of Great Falls; and Grace Rethlefsen of Janesville, Wisconsin.

The Wildlife Society Honors Mitchell

Jim Mitchell, wildlife manager for north central Montana (Great Falls—Region 4), was presented with the "Distinguished Service Award" for 1988 by the Montana Chapter of The Wildlife Society. The award recognized Mitchell for three decades of contributions toward scientific management of Montana's wildlife resources. He retired from the Department of Fish, Wildlife and Parks (DFWP) on February 26, 1988.

Although Mitchell had a special calling toward big game, he was viewed by his peers as "an all-around professional wildlifer."

He received both his B.S. and M.S. degrees in fish and wildlife management from Montana State College (now Montana State University). His master's research involved mink movements and populations from 1955-58 on the lower Madison River in southwestern Montana. His earliest duties for the Montana Fish and Game Department (now Department of Fish, Wildlife and Parks) included an inventory of game bird populations near Lewistown.

Mitchell was a veteran elk manager of the Gallatin elk herd (1950s) and the Sun River elk herd (since 1965). He also served as information officer for the Beaverhead National Forest in 1962-63 and for the Great Falls region of the DFWP from 1963-65.

Mitchell's philosophy of game management was uncomplicated: Hire the best biologists available, collect the best field information possible, and recommend hunting seasons that provide the most benefits to sportsmen while protecting the base resource. When answers to management questions were unavailable, Mitchell initiated research to get the answers.

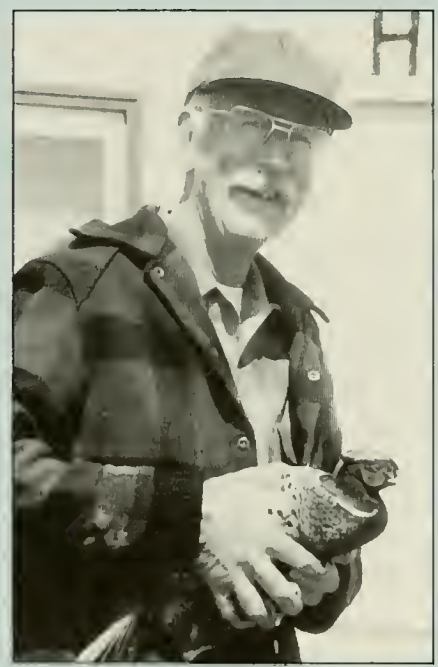
He was a field manager—spending as much time in the field with his biologists as his administrative schedule permitted. Mitchell was active in the Montana Chapter of The Wildlife Society since its charter in 1962. The Wildlife Society, organized in 1937, is an international group of over 8,000 professional wildlife

biologists and others dedicated to the scientific management of wildlife resources and their habitats.

Nick Kramis—Wildlife's Friend

Fish and wildlife in the Bitterroot Valley of western Montana have lost a good friend—a truly good friend. Nick Kramis, past president and life member of the Ravalli County Fish and Wildlife Association, died February 24, 1988.

Nick balanced his 77 years of experience with wildlife in the Bitterroot with a commitment to its future. He could recall Montana's first pheasant hunting season in 1928, while at the same time plan and implement a successful habitat enhance-



Nick Kramis

ment program for landowners to ensure the pheasant's future in the valley.

Nick's commitment to ensuring a future for fish and wildlife was a personal one in which he provided leadership through his enthusiasm and by setting an example for others to follow. He was honored for his dedication to conservation by the Montana Wildlife Federation in 1982 as the "Sportsman of the Year."

Nick is gone, but he will not be forgotten. The crowing of a proud rooster pheasant echoing through the valley fog reminds us of his accomplishments with pheasants. Every time a youngster and a hunting dog flush a long-tailed, cackling rooster from the cattails, Nick can smile:

continued on page 18

graphics courtesy *Outdoor Highlights*, Illinois Dept of Conservation

The "Reeeeallly" Big Ones

As years go, 1987 was a "reeeeallly" big one for fishing records—seven records fell, one was tied, and a new species was added to the record list.

Joining the list at 0.72 pounds was the yellow bullhead. Wade Fredenberg of Billings took the 10.6-inch lunker from the Yellowstone River at Captain Clark Fishing Access Site near Custer.

Neil Berg's 1974 record for walleye—14 pounds even—was tied by Jim Carver of Malta. Carver caught his walleye in Nelson Reservoir in 1983, but it wasn't added to our records list until 1987.

John J. Hailstone, Billings, took over the lead in the golden trout category. He caught his 3.58-pound golden at Lightning Lake in the Stillwater drainage of the Absaroka-Beartooth Wilderness Area. It outweighed the previous record, held by Terry Cameron, by 0.44 lb.

Barry Gillis' 1972 record for chinook (king salmon) was shattered by Joyce Good's 7-pound, 11-ounce chinook. Ms. Good, of Wolf Point, caught her chinook in the McGuire Creek area of Fort Peck Reservoir. Gillis' previous record—4 pounds, 7 ounces—was taken from the Missouri River.

It could be said that the record for the longnose sucker was a "Storm-y" one. Havre resident Kathy L. Storm added the longnose to the records list in 1986 with a 1.21-pounder taken from the Milk River. Her record was shattered in 1987—by a 3.09-pounder taken from the Missouri River near Virgelle by one Sidney L. Storm, who just happens to be her husband. A "reliable" source has told *Montana Outdoors* that some friendly husband-wife competition was involved—and that Sidney's goal for 1988 is to add the mountain sucker to the records list. Another contender for the longnose record was Gary Dutton of Libby who took a 1-pound, 6-ounce longnose from the mouth of the Fisher River.

Mike Hangas' record for mountain whitefish held for 10 years, until Mervin "Frog" Fenimore of Libby took the lead with a 5-pound, 1 1/2-ounce whitefish caught in the Kootenai River below Libby Dam. Hangas' previous record whitefish weighed 4 pounds, 9 3/4 ounces, and he caught it in the Blackfoot River.

Loyal Herreid's northern squawfish outweighed the previous record, held by Jim Conlin, by 0.16 pound. Herreid, of Polson, caught his 7.25-pounder on the lower Flathead River near the National Bison Range at Moiese.

Horseshoe Lake, 1975, and Bob Higson lost out to Fort Peck Reservoir, 1987, and Marvin Loomis. Loomis' smallmouth bass weighed in at 5.11 pounds, compared with the previous record of 4 pounds, 11 1/2 ounces. Loomis lives in Jordan.

Another long-standing record—this one from 1974—was broken by Vernon Schmid's yellow perch. Schmid, of Kalispell, caught his 2.08-pound perch in Ashley Lake. It bested Gerald Pottratz' 2-pounder, which he caught at Nelson Reservoir.

What do you do if you think you've caught a record fish? The Department of Fish, Wildlife and Parks requires that you (1) harvest the fish legally, (2) weigh it on an inspected scale (most grocery store scales are inspected), and (3) have the fish identified. *Whenever possible*, that means verification by department personnel. If you can't find a department employee, you must present a photograph from which the fish can be identified; with some species, this is difficult. If you didn't have a department employee weigh the fish, you must present documentation from the store where it was weighed.

As you set off for your fishing adventures this season, remember that records—especially fishing records—are made to be broken. Add your name to the 1988 list by catching a "reeeeallly" big one.—*Kay Morton Ellerhoff, associate editor*■

Species	Weight lbs.	ozs.	Angler	Year	Location
Arctic grayling	2	10½	Steve Houser	1986	Hyalite Reservoir
Bigmouth buffalo	32	6	Gary Lundman	1979	Missouri River (Slippery Ann Game Station)
Black bullhead	1	11	Mike Mitchell	1977	Horse Creek (McCone Co.)
Black crappie	3	2	Al Elser	1973	Tongue River Reservoir
Blue sucker	7	4	Dudley L. Thiel	1986	Yellowstone River (near Sidney)
Bluegill	2.64		Brent Fladmo	1983	Peterson's Stock Dam
Brook trout	9	1	John R. Cook	1940	Lower Two Medicine Lake
Brown trout	29	0	E.H. "Peck" Bacon	1966	Wade Lake
Bull trout	25	10	James Hyer	1916	unknown
Burbot (ling)	13	4	Paul Keller, Ernie Schutt	1980	Missouri River (below Fort Peck Dam)
Carp	38	8	Don Bagley	1986	Eyraud Lakes
Channel catfish	25.89		Gordon Wentworth	1984	Fort Peck Reservoir
Chinook (king salmon)**	**7**	**11**	**Joyce Good**	**1987**	**McGuire Creek**
Coho salmon	4	14	Irven Stohl	1973	Fort Peck Reservoir
Cutthroat trout	16	0	William D. Sands	1955	Red Eagle Lake
Freshwater drum	17.55		Dean Johnson	1985	Fort Peck Reservoir
Golden trout**	**3.58**		**John J. Hailstone**	**1987**	**Lightning Lake**
Goldeye	2	9	Lester Estenson	1977	Nelson Reservoir
Kokanee (salmon)	5	15	Forrest Johnson	1976	Pishkun Reservoir
Lake trout	42	0	Dave Larson	1979	Flathead Lake (east shore)
Lake whitefish	10	0	Ruby Mutch	1986	Lower St. Mary Lake
Largemouth bass	8	2½	Juanita A. Fanning	1984	Milnor Lake
Longnose sucker**	**3.09**		**Sidney L. Storm**	**1987**	**Missouri River**
Mountain whitefish**	**5**	**1½**	**Mervin "Frog" Fenimore**	**1987**	**Kootenai River**
Northern pike	37	8	Lance Moyler	1972	Tongue River Reservoir
Northern squawfish**	**7.25**		**Loyal Herreid**	**1987**	**Lower Flathead River**
Paddlefish	142	8	Larry Branstetter	1973	Missouri River
Pallid sturgeon	60	0	Gene Sattler	1979	Yellowstone River
Pumpkinseed	0.95		Tim Colver	1985	Milnor Lake
Pygmy whitefish	0.16		Orlin Iverson	1982	Ashley Lake
Rainbow trout	20	0	C.J. Brohaugh	1952	Cliff Lake
Rainbow-cutthroat hybrid	30	4	Pat Kelly	1982	Ashley Lake
Sauger	7	2	Raymond V. Johnston	1975	Tongue River Reservoir
Shorthead redhorse sucker	4.68		Ray Quigley	1985	Marias River near Loma
Shortnose gar	3	1	John Johnson	1977	Fort Peck dredge cuts
Shovelnose sturgeon	13.72		Sidney L. Storm	1986	Missouri River
Smallmouth bass**	**5.11**		**Marvin Loomis**	**1987**	**Fort Reck Reservoir**
Smallmouth buffalo	9	4	Mac McKinney	1977	Hauser Lake (west side)
Stonecat	0.42		Robert M. Garwood	1985	Milk River at Havre
Utah chub	1.43		M. Steve Kovatch	1986	Canyon Ferry Reservoir
Walleye*	**14**	**0**	**Neil Berg, Jim Carver (tie)**	**1974, 1983**	**Nelson Reservoir**
White bass	1	2	Ludwig Dubbe	1986	Fort Peck dredge cuts
White crappie	2	2	Drew Jackson	1978	Tongue River Reservoir
White sturgeon	96	0	Herb Stout	1968	Kootenai River
White sucker	5	5⅓	Fred Perry	1983	Nelson Reservoir
Yellow bullhead***	**0.72**		**Wade Fredenberg**	**1987**	**Yellowstone River**
Yellow perch**	**2.08**		**Vernon Schmid**	**1987**	**Ashley Lake**

***New Montana record for 1983**
****New Montana record for 1987**
*****New to Montana's record list**

His legacy lives on.—*Bill Thomas, Region 2 (Missoula) information officer*

Photo Expo at Lone Pine

The Fourth Annual Wildlife and Nature Photography Expo will be conducted June 18 at Lone Pine State Park and Visitor Center near Kalispell. Its theme is wildlife, scenic, and nature photography, and organizers bill it as one of the largest wildlife and nature photography shows in Montana. The expo opens at 10 a.m. and runs until 6 p.m.

Exhibitors will offer prints, calendars, posters, and other art items for sale.

Lone Pine State Park, which offers a superb view of the Flathead Valley, is five miles southwest of Kalispell. From U.S. Highway 2 in Kalispell, turn south on Meridian Road to Foys Lake Road. After four miles, turn left at the Lone Pine State Park sign. For more information about the expo, contact Becky Smith, Lone Pine programmer, at 406/755-2706.

The Cold that Kills

Spring in Montana means the beginning of the fishing and boating seasons for many sportsmen. Spring also means cold water. Now there's nothing wrong with cold water—until you fall in and your life is suddenly in jeopardy. In such a situation, you have relatively little time to make the right decisions before becoming a victim of "the cold that kills"—hypothermia.

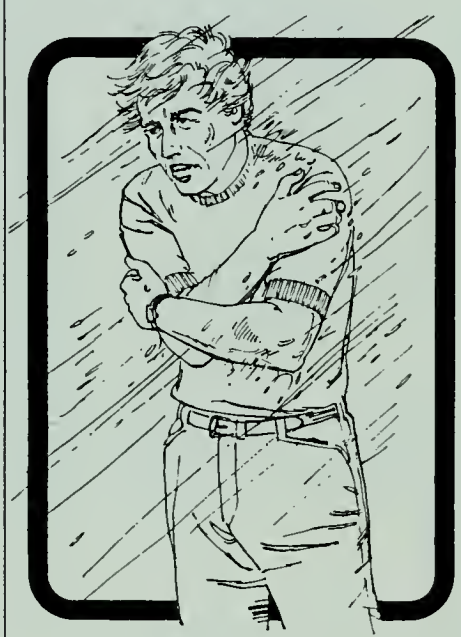
In many boating accidents, older, experienced fishermen in small, unstable boats become hypothermia victims. Often they cannot swim, are not in particularly good physical shape, and do not wear life jackets. To further complicate matters, they may have consumed alcohol while fishing. If the boat should capsize or someone should fall overboard, actions over the next few seconds become critical and may determine whether those immersed live or die. People who have been drinking sometimes fail to struggle and simply disappear. They can become confused and disoriented, attempting to swim downward instead of up. The shock of sudden immersion in cold water may also cause a heart attack and the stricken person may lose consciousness and sink. It all happens so quickly; there is seldom time to look for, much less put on, a life jacket.

Some people attempt to swim for shore and in the process rapidly lose body heat and the ability to function. As a result, they quickly become exhausted and drown. This loss of body heat is called "hypothermia," and it occurs when the body loses heat at a faster rate than it is produced.

Hypothermia is generally produced by exposure to wind or wetness. Violent shivers, an attempt by the body to produce heat by exercise, indicates the onset of hypothermia. Confusion, stiffness, slurred speech, and unsteady walk are other symptoms.

Water is an efficient conductor of heat and will remove body heat much faster than air. Thrashing around in the water causes increased blood flow to the extremities and peripheral tissues, thus causing speeded cooling. Wearing a life jacket will help in two ways: (1) It lessens the need to move to stay afloat, and (2) it helps insulate the body from the cold water, reducing heat loss. Areas of the body most affected by cold water are the head, neck, sides, and groin, where many of the main blood vessels are close to the surface.

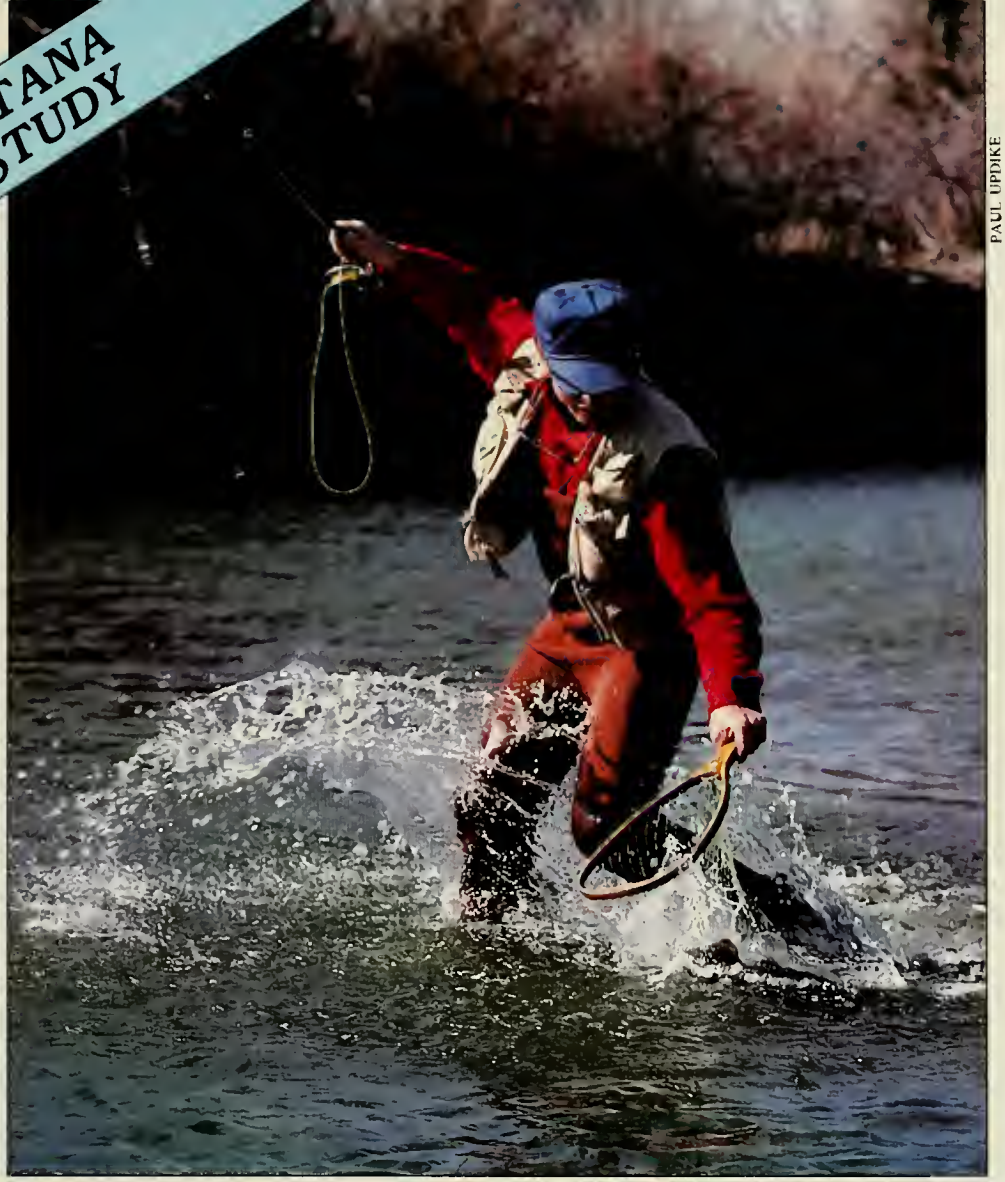
Initial treatment for hypothermia requires moving the victim as quickly as possible into some form of shelter.



Remove wet clothes and wrap the victim in a sleeping bag or blankets. Handle the victim gently and take him to a medical facility as quickly as possible. If professional medical help is out of reach, apply warm, moist towels to the head, neck, sides, and groin. You can also fill containers with hot water, wrap them in blankets, and place these next to the victim. Skin-to-skin contact and mouth-to-mouth resuscitation are other emergency measures. Never give alcoholic beverages to a victim in an attempt to produce heat. Doing so may produce an abrupt drop in the critical core temperature and further lessen the victim's chance for survival. Although on-the-spot emergency treatment of a hypothermia victim to prevent further heat loss is necessary, take the victim to a hospital where professional medical treatment is available as soon as you can.

Statistically, boating is one of the safest forms of recreation in which an individual or family can participate. Each year, about one-fourth of the American population is involved in some form of boating. Yet every year, hundreds die in boating accidents, primarily from drowning, and in many fatal cases, hypothermia has played a part. The majority of these accidents would not occur if the operators and passengers followed rules of safe boating, wore their life jackets, and forgot about the booze. —*Jim Liebelt, Region 6 (Glasgow) information officer*

THE MONTANA RIVERS STUDY



PAUL UPDIKE

Here's To The Rivers!

edited by Sally Hilander

contributors: Janet Decker-Hess, project manager and fisheries; Gael Bissell, wildlife; Stewart Allen, recreation; Tom Ring and Nancy Johnson, geologic features; Susan Reel, natural features

A Dedication: Larry S. Thompson

Larry Thompson brought to the Montana Rivers Study the same boundless energy, enthusiasm, and dedication that he brought to every project in which he was involved. Larry, an original member of our study team, assessed the natural and geologic features of Montana's rivers. And when he became program director for the Natural Resource Information System, it was only logical that Larry become our data manager.

I knew Larry only from our work together—our daily conversations were always one of the highlights of my day. When I called that late April afternoon to chat, it struck me as odd to hear he was at the doctor's. Larry was never sick. When he returned my call, the discussion of the visit to the doctor was squeezed in between his exuberant description of his float down the Smith the weekend before. That was the last day of work for Larry; his next task for the study was to write his portion of this article, and that was never to happen. Larry died Feb. 5, 1988, following a fight for nine months with a malignant brain tumor.

So, Larry, this article is for you; dedicated to a man whose life was much like a Montana free-flowing river—growing from a trickle in a headwater canyon, gaining strength and force to become a priceless resource, uncompromising, wild, and free.—Janet Decker-Hess

THE MONTANA RIVERS STUDY

Montana's rivers are prized. Anglers sing the praises of rivers when a well-cast fly lures a wild trophy trout, and kayakers rejoice in a river's frothy course. A river satisfies the needs of a lone elk as it sips from cool, clear waters. The value of a river is so personal that any attempt to measure, prioritize, or rank it seems almost a desecration. But when development is proposed, it's vital to have a method to quantify a river's value, and the Montana Rivers Study attempted to provide that method.

In 1980, Congress established the Northwest Power Planning Council, which was mandated to develop a program balancing past and future hydropower development in the Columbia River Basin with protection, mitigation, and enhancement of ocean-running and resident fish and of wildlife. Ten percent of western Montana's free-flowing rivers have been lost as a result of past dam construction, and many more miles have been impacted by dam operation. East of the Continental Divide, over a dozen major dams have interrupted the Missouri, Madison, Beaverhead, and Bighorn.

In an effort to protect rivers in western Montana with outstanding and unique fish and wildlife values from any future hydroelectric development, a measure in the Northwest Power Planning Council's program requested a study to assess natural resource values of the basin's streams and rivers, with funding supplied by the Bonneville Power Administration. Hence, the Pacific Northwest Rivers Study was designed in 1985, including assessment of Montana's rivers by the Montana Rivers Study (MRS). In addition to identifying stream reaches for the council's Protected Areas Program, study results were also to be used for other energy-related programs.

The Montana Rivers Study was coordinated by the Montana Department of Fish, Wildlife and Parks (DFWP), with assistance from the Department of Natural Resources and Conservation (DNRC), the U.S. Forest Service (USFS), the U.S. Fish and Wildlife Service, the Bureau of Land Management, and state universities. The study inventoried and compiled data and determined criteria to assess the significance of a river's fisheries and wildlife values and recreational, natural, and cultural features. Following the assessment, each reach was rated as Class I for unique or outstanding resources, Class II for substantial resources, Class III for moderate resource values, Class IV for limited resources, and Class V for unknown values. Streams within national parks and wilderness areas were excluded from the assessment because they are already protected from hydroelectric development. Montana's Indian reservations were not included. Here's a brief look at how each resource was evaluated.

The MRS utilized the Montana Interagency Stream Fishery Data Base, developed over 15 years ago by state and federal agencies, in the fisheries assessment. Each stream reach was rated in two categories, with the final classification being the higher rating. In the *habitat and species value category*, points were awarded for all fish species, including Montana's fishes of special concern (native fishes found in limited numbers or locations) and for local value in more arid or remote portions of Montana. Streams containing valuable spawning habitat or those that were spring creeks were given additional consideration. The *sport fishery value category* was based on evaluation of fish abundance indicated by numbers and sizes of game fish, access, aesthetics, and fishing pressure. Both categories assessed only wild trout populations since Montana does not stock rivers or streams.

A total of 18,868 miles of streams in 2,521 reaches was assessed for fisheries values. Twelve percent of the river miles received a Class I final resource value, with the habitat and species value providing nearly 65% of the Class I miles. It took quite a river to receive an outstanding classification in the sport fishery category, with only 764 miles making the grade.

A statewide wildlife data base did not exist before the MRS, so this major task began under the guidance of a team of wildlife biologists and managers from state and federal

The Montana River Drainages

1. Kootenai River Drainage
2. Upper Flathead River Drainage
3. Upper Clark Fork River Drainage
4. Lower Clark Fork River Drainage
5. Big Hole and Beaverhead River Drainages
6. Missouri Headwaters
7. Upper Missouri River Drainage
8. Rocky Mountain Front
9. Central Missouri River Drainage
10. Lower Missouri River Drainage
11. Upper Yellowstone River Drainage
12. Lower Yellowstone River Drainage

map courtesy Earth Science Dept., MSU

agencies. Individual river reaches were not rated. Instead, wildlife units were created, describing either a main stem reach, a river basin, or a series of tributaries. Wildlife resources were evaluated for habitat and species. The habitat value was determined by points awarded for riparian quality and diversity, and designated wildlife lands along the reach or basin. Species criteria stressed wildlife diversity and abundance within each assessment unit. The species value was based on the highest ratings of three species criteria: (1) threatened and endangered species, (2) riparian species of special concern, and (3) game and furbearing species. Of the 400 wildlife units identified, 11% achieved Class I final resource value. The drainages of western and southwestern Montana contained 82% of the Class I units and nearly 60% of the Class II units.

The MRS also was the first comprehensive study of the recreational resource of Montana rivers. River reaches having recreational value were inventoried, mapped, and evaluated by state and federal recreation managers and 300 private and commercial river users. A questionnaire on each river reach, describing water character and boating suitability, water and land-based activities, use levels, access, recreation opportunity, scenic quality, and the number and type of developed recreation sites, was completed by managers and users familiar with that reach. Nearly 12,000 river miles were assessed, and 9% were rated as outstanding, 18% as substantial, 43% as moderate, and 21% as limited. Of the boated stretches, only 5% were rated as containing major rapids. Thirty-five percent of the outstanding river segments were in southwestern Montana.

The assessment of botanical and geologic natural features identified at individual sites was based primarily on published information and advice from experts within the state university system, museums, U.S. Geological Survey, and DNRC. Sites examined included exemplary river-related geologic and hydrologic features, endangered and threatened plants, rare or unique plant communities, and previously designated areas. The assignment of value classes was based on resource scarcity, public use, formal designation, and scientific value. The inventory's effort concentrated on those sites having the highest natural feature values, reflected by the fact that 57% of the 400 botanical features received a Class I or II rating. Most of the botanical features and designated areas were located in the western part of the state. More than 900 geologic features were identified, mostly in central and western Montana.

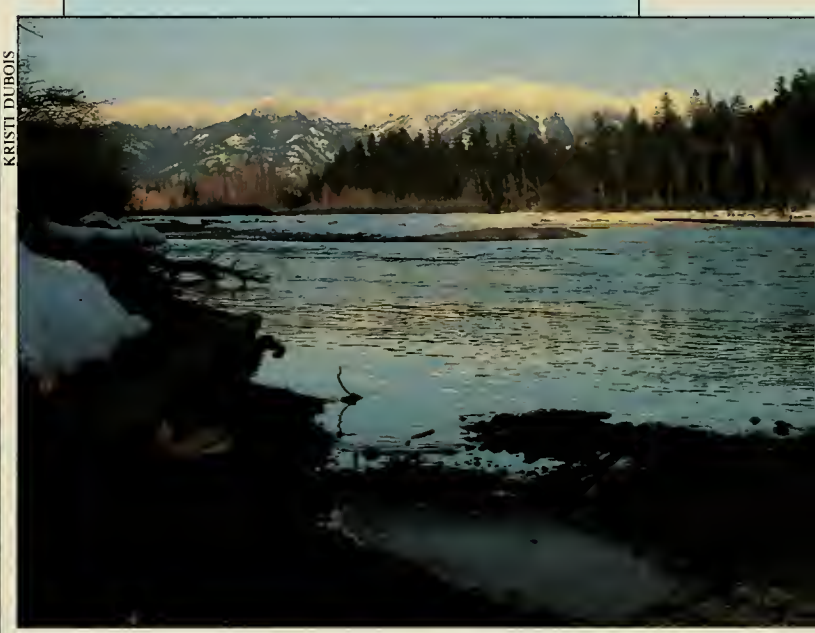
An overwhelming amount of natural resource information was collected by the Montana Rivers Study to identify the most outstanding rivers for protection from any future hydroelectric development. In October 1987, the state of Montana recommended 832 stream miles be protected for their outstanding fishery values and 1,484 stream miles be included for wildlife values in the council's Protected Areas Program. A decision by the council on the program is expected in late 1988. In addition to achieving its original goal, study results have also been used by federal agencies for Wild and Scenic Rivers review and by other agencies on a project-by-project basis. Well beyond the results of the study, however, was the perspective gained concerning the unique and outstanding character of Montana's rivers. Here is a salute to the last of what is best in Montana—our free-flowing rivers, their drainages, and the natural resource values that set them apart, one from the other.

STEVE WIRT

JOHN McNEAL

Ten percent of western Montana's free-flowing rivers have been lost as a result of dams. The Montana Rivers Study identified rivers with outstanding and unique fish and wildlife values in an effort to protect them from future hydroelectric development.

KRISTI DUBOIS



Kootenai River Drainage

Boundaries: Libby Dam to Idaho border
Drainage size: 11,740 square miles
Main stem length: 100 miles
Tributaries: Yaak, Tobacco, Fisher, Wigwam
Cities/towns: Libby, Troy
Access: U.S. Highway 2

The Kootenai River drainage is a land of contrasts. Here in northwestern Montana, the Purcell, Cabinet, and Salish mountains seem to rise even beyond 7,000 and 8,000 feet. They rise from valley floors that are the lowest in the state at only 1,800 to 1,900 feet. Eastbound Pacific storms stumble on these ranges and drop up to 100 inches of rainfall each year, nurturing huge conifer forests in a climate moist by Montana standards. The long, U-shaped canyons of these impressive ranges drain to form the Kootenai and Yaak rivers.

Named for the Kutenai Indians, the "people of the waters" who inhabited the area, the river originates in British Columbia's Kootenay National Park. It flows through Montana for 100 of its 485 miles before joining the Columbia at Castlegar, B.C. The free-flowing course of the Kootenai River was shortened considerably when the Army Corps of Engineers closed the gates on 400-foot Libby Dam in 1973, creating Lake Koocanusa, which extends into Canada for almost half its 90 miles. Since that time, various plans to build other dams between Libby Dam and the falls have been defeated. The proposed Jennings Rapids hydroelectric project 10 miles below the existing dam is now pending before the Federal Energy Regulatory Commission.

The Montana Rivers Study assessed 300 miles of river in 23 segments for their recreational value, and 100 miles were Class I—including the Kootenai River itself between the Montana Highway 37 Bridge and the Idaho border and the Yaak River between the town site of Yaak and the mouth. The rivers were valued for their fishing quality, wildlife habitat, boating potential, and cultural and historic sites. Some rivers in the region received lower ratings because private land restricted access.

Kootenai Falls is the main scenic attraction in this comparatively remote, mountainous river drainage. Between the towns of Libby and Troy, the placid river suddenly gathers momentum, surging first through China Rapids and then over

JOHN McNEAL

STEVE WIRT

DON JONES

Kootenai Falls (above), on the Kootenai River between Libby and Troy, is one of only two places in Montana where rare harlequin ducks (lower right) congregate and breed. Montana's last known breeding population of Columbian sharp-tailed grouse (upper right) inhabits an isolated section of "Palouse prairie" grassland northwest of Eureka.

Kootenai Falls, dropping 90 feet in less than a mile. The main falls is 30 feet high. A few madcap kayakers have successfully run the frantic, pounding rapids of Kootenai Falls, but for most, the cedar-screened overlook along U.S. Highway 2 or the swinging footbridge that dangles in the narrow two-mile canyon below is adventure enough.

Kootenai Falls is the only known site outside Glacier National Park where the rare harlequin duck congregates in plain view. After traveling 600 miles up the Columbia River Basin from the rocky Pacific Coast, this summer visitor breeds exclusively on turbulent whitewater streams. The drainage also provides important habitat for several threatened and endangered species, as well as for game animals, earning it consistently high wildlife species values in the Montana Rivers Study. Seventy-two percent of the land surveyed contains critical habitat for the grizzly bear, and nearly two-thirds of the drainage's 39 wildlife units support essential winter range for white-tailed and mule deer and elk. Bald eagles winter along the entire Kootenai River as well as portions of the Fisher, Tobacco, and Libby Creek drainages. Moose and black bear inhabit all but a small percentage of the drainage. More than half the units earned final resource values of Class I or II.

The fisheries of the Kootenai River drainage are as unique as the wildlife. A 21-mile stretch of the Kootenai River between the falls and the Idaho border received a Class I final resource value, because it might still provide spawning habitat for a living "sea monster," the white sturgeon, the largest freshwater sport fish in North America. "Wiyal" to the Kutenai Indians, white sturgeon originated more than 100 million years ago during the Mesozoic Era and were last seen in Montana's Kootenai River in 1981. Here and elsewhere, their future is uncertain, due to altered flow patterns and temperature changes resulting from dam operations. An attempt to classify them as "endangered" under Montana law failed during the 1985 Legislature.

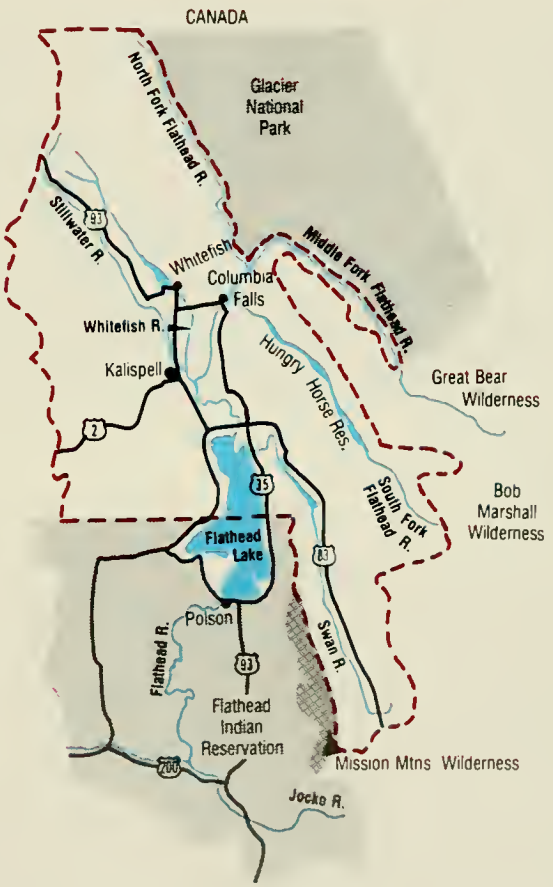
Easy access, abundant rainbow trout, and a good chance of landing a trophy trout earned the Kootenai River between Libby Dam and the falls an outstanding sport fishery rating. The tailwater section of the river provides a trophy fishery for rainbow and bull trout, with "lunkers" weighing five to 15 pounds common. Despite the Class I main stem fisheries, however, most miles in the Kootenai River drainage received a final fishery rating of Class III due in part to inaccessibility for recreation or research.

No description of the Kootenai River country would be complete without mention of its enormous trees, nurtured by the moist climate. The 839-acre Lower Ross Creek area south of Troy has one of the last remaining stands of old-growth western red cedar, survivors of wildfires that swept through these forests at the turn of the century. Ross Creek is one of seven proposed USFS Research Natural Areas in the drainage. Along the Yaak River Gorge is a near-pristine forest community of old-growth western hemlock, Douglas-fir, and ponderosa pine. Several other plants in the Kootenai River drainage are listed for protection by the Montana Rare Plant Project, including Geyer's biscuit-root and the endangered northern bastard toad-flax, a Pacific slope species that grows in Montana's spruce forests.

Glaciers have etched into the landscape of the Kootenai River drainage unique features that one needn't be a geologist to appreciate. For example, on Indian Creek along U.S. Highway 93 north of Eureka, one can see a field of "drumlins"—elongated hills of compacted glacial till shaped during the Pleistocene Epoch. Stream terraces formed by different water levels are visible five miles above the mouth of the Yaak River. They appear as two sets of stairs descending toward each other on opposite sides of the stream, and are yet another feature of this unique Kootenai River drainage.

Upper Flathead River Drainage

Boundaries: headwaters to Clark Fork River
Drainage size: 11,425 square miles
Tributaries: North, Middle, South forks; Swan, Jocko, Stillwater, Whitefish
Cities/towns: Columbia Falls, Kalispell, Polson
Access: U.S. Highway 2 and 93, Montana 200



This is a land of grizzly bears and wolves, of whitewater adventure, cutthroat trout, and wilderness. From the rugged summits of the Mission, Swan, Salish, Whitefish, and Flathead mountains to the peaceful backwaters of rivers born in their highest reaches, the Flathead is Montana's purest glacier country. Flathead Lake, at 171 square miles, is the largest natural freshwater lake west of the Mississippi and one of the state's most coveted recreational sites.

Society long ago recognized the need to protect some of the Flathead's outstanding features, and created both the million-acre Glacier National Park and the Bob Marshall Wilderness, America's first designated wilderness area. The "Bob" and the contiguous Great Bear wildernesses total 1.7 million acres. Congress also designated the three forks of the Flathead River

as part of the National Wild and Scenic River System. Because wilderness areas and national parks are exempt from hydropower development, the Montana Rivers Study did not address lands within their boundaries. The upper Flathead River drainage received outstanding ratings anyway.

Whitewater boaters find their thrills in Fool Hen Rapids on the North Fork of the Flathead River, Meadow Creek Gorge on the South Fork of the Flathead River, and the "Mad Mile" on the Swan near Bigfork, site of an annual whitewater slalom and downriver race. Boating occurred on 83 of the 138 river segments studied, but the primary recreation in the area is fishing—from shore on two-thirds of the segments and from boats on half. The upper Flathead River drainage also is popular for camping, hiking, and sightseeing. From atop Teakettle Mountain north of Columbia Falls one can see the glaciers' handiwork—three fault block mountains, complex folded and faulted mountains, maior valleys, the Rocky Mountain trench, Flathead Lake, glacial features of erosion and deposition, and features of the Flathead River on the main valley floor.

CONRAD ROWE

BOB KIESLING

STEVE SHELLY

Native westslope cutthroat trout (top) were nearly wiped out in the mid-1900s when other trout species were introduced into Montana's waters. The Swan River Oxbow Preserve (above) was purchased by The Nature Conservancy to protect *Howellia aquatica* (right), an endangered plant found only in a few locations in Montana and Washington.

The upper Flathead River drainage includes wildlife habitat as unique and diverse as any in the state, harboring healthy populations of nearly every species native to the region. All but 10 of the 43 wildlife units contained critical grizzly bear habitat, and 28 contained breeding or wintering grounds for the bald eagle. Currently, Montana's only populations of the endangered gray wolf live along the North Fork of the Flathead River. Two active packs, descendants of the "Magic Pack" that first became established in 1985, now roam the North Fork Valley.

Earning Class I ratings in wildlife habitat and species values were the Middle Fork of the Flathead and the Flathead main stem from Columbia Falls to Kalispell. These river reaches contain exceptional and diverse riparian habitats, with mature cottonwood forests, abundant wetlands, and islands. The Flathead above Kalispell earned a Class I species value for its river otters, ospreys, and great blue herons, while the Middle Fork earned its outstanding status for supporting important deer, elk, mountain goat, moose, and black bear habitat. Where the Flathead main stem has abandoned old channels and formed new, a series of sloughs, crescent-shaped ponds, and lakes has resulted, providing excellent habitat for rare and endangered plants as well as wildlife. Egan Slough, near the mouth, contains the Columbia water-meal and the pygmy water lily, both listed as rare by the Montana Rare Plant Project.

A unique and little disturbed section in the upper Flathead River drainage is the 15 miles of Swan River between Squaw Creek and Swan Lake, part of which received a Class I wildlife habitat and species value. It contains both a 1,778-acre national wildlife refuge and The Nature Conservancy's 400-acre Swan River Oxbow Preserve, purchased to protect the largest known concentration of the globally endangered *Howellia aquatilis*, an aquatic plant found only in a few locations in Montana and Washington, and nowhere else in the world. Other rare plants in the upper Flathead drainage include the threatened Columbia River crazyweed, two species of moonwort, and a rare Montana orchid, the clustered lady's-slipper, found only in wooded areas in the foothills of the Mission Mountains.

The upper Flathead River drainage is the geographic stronghold of the westslope cutthroat trout, a fact that earned the drainage the greatest number of Class I stream reaches and stream miles in the state, and the highest number of Class II reaches in the habitat and species value. The westslope cutthroat trout is one of two subspecies that emerged when cutthroat from the Pacific Ocean reached the western North America interior during the last ice age, 70,000 years ago. They were nearly wiped out in 30 years beginning in the mid-1900s, when more sporting trout species were introduced into Montana's waters. Logging, mining, and agriculture took their toll on habitat too. Although remaining populations appeared to be thriving, genetic purity and vigor were being

DIANE ENSIGN

Boating and fishing are popular pastimes in the Flathead River drainage. The canoeists above are participating in the annual "Great Lake to Lake Race" from Whitefish Lake to Flathead Lake.

lost due to extensive hybridization with rainbow and Yellowstone cutthroat trout.

Ecological and genetic research in the last 25 years has led to major fisheries management changes designed to preserve and maintain the native cutthroat species. Intense investigation into westslope populations in the Flathead by DFWP has contributed to the high ratings in habitat and species value.

The sport fisheries of the Flathead depend on populations of westslope cutthroat, bull trout, and kokanee migrating from Flathead Lake to spawn in the main stem and its tributaries. The 80 miles of Class I sport fishery on the main stem and North Fork depend on seasonal migrations from the lake. Fisheries in the Swan, Whitefish, and Stillwater rivers are rated low in comparison to the main Flathead and its three forks. The Swan River, however, is a Class II sport fishery from Lindbergh Lake to Swan Lake and 11 Swan River tributaries contain essential spawning habitat or potentially pure westslope cutthroat trout—contributing yet more to the upper Flathead River drainage's high value.

Upper Clark Fork River Drainage

Boundaries: headwaters to Bitterroot River
Drainage size: 9,003 square miles
Main stem length: 140 miles
Tributaries: Little Blackfoot River, Flint Creek, Blackfoot River, Rock Creek, Rattlesnake Creek, Bitterroot River
Cities/towns: Deer Lodge, Drummond, Clinton, Bonner, Milltown, Missoula
Access: Interstate 90

From the pristine peaks of the Bitterroot Mountains to the mining district of Butte and Anaconda, the headwaters of the Clark Fork River and its tributaries are a study in diverse topography, land use, and resource values. The rivers and streams course their way through wilderness areas and abandoned mines, alfalfa fields and ghost towns, mountain forests and municipalities. Elevations vary from 3,000 to

10,000 feet in this drainage, which includes the Anaconda, Flint Creek, Sapphire, Garnet, and Bitterroot mountains. Ripples and other evidence of glacial Lake Missoula extend to the upper portions of the drainage, and its 35 parallel benches indicate a water level 700 feet above the present valley floor. The 2,900-square-mile lake formed near what is now the Idaho border when lobes of the vast Cordilleran ice sheet from British Columbia dammed the Clark Fork. The dam apparently was breached several times.

The upper Clark Fork River drainage earned high marks in nearly every resource value. Three Class I sport fisheries were identified in the 2,000 miles of river and stream assessed for fisheries, and 30 reaches received a Class I in habitat and species value. The drainage holds 730 stream miles with a Class II fisheries final resource value, the largest number in the state. The upper Clark Fork River drainage also contains 52 of the 228 natural feature sites receiving a value of Class I or II. For recreation, the study inventoried 92 river segments in 1,600 miles, and scenic quality was substantial or outstanding on half. Recreational attributes were outstanding on 13% of the miles, substantial on 21%, and moderate on 47%—a reflection of the diverse terrain, access, use levels, scenery, and fishing opportunity. A Montana river having a "moderate" value, however, is still a valuable resource from a national perspective.

The Clark Fork River begins where Silver Bow and Warm Springs creeks meet. Perhaps on no other river in Montana are man's impacts and his efforts to mitigate them so apparent. On the upper five miles of the river, abused for more than half a century from untreated mine effluent, trout populations now thrive. The estimated number of brown trout per mile went from zero in 1972 to more than 2,000 in 1986 following settling pond construction and other water quality improvement measures by the Anaconda Company. The reach

GEORGE WUERTHNER

GEORGE WUERTHNER

A gem among Montana rivers, the Blackfoot (left) offers fishing, camping, and whitewater floating. The Bitterroot River (above) provides essential habitat for waterfowl, bald eagles, and ospreys (below).

RODNEY SCHLECHT

The Clark Fork River begins where Silver Bow and Warm Springs creeks meet (below). Degraded for more than half a century by untreated mine effluent, the upper Clark Fork's fishery has recently been restored.

BILL THOMAS

received a Class II fishery value, a dramatic improvement over the 1959 Class V rating.

Forty-eight miles of Rock Creek, from the confluence of its middle and east forks to the Clark Fork, has been a Class I sport fishery since 1959 and the entire Rock Creek drainage was rated outstanding for wildlife because of excellent game populations. Rock Creek was one of three in the state earning a Class I from all recreational managers assessing the stream. Protection of the natural resource values on Rock Creek has long been a priority in Montana. Most recently, Montana private utilities established a trust fund of $1.65 million to mitigate damages to the Rock Creek drainage caused by construction and presence of a twin 500-kilovolt power line across the lower creek.

The Blackfoot River is a gem among Montana rivers, with its opportunities for fishing, camping, or whitewater floating

through exhilarating rapids. Among the favorites are Round-up, Thibadeau Falls, and "the ledge"—a pour-over backed up by a long, calm eddy, a popular surfing spot for kayakers. A 30-mile stretch of the Blackfoot is managed under a unique "recreation river corridor" system that includes 9,000 acres of The Nature Conservancy conservation easements from private landowners. Such easements protect the scenic, cultural, and natural fish and wildlife values from encroaching development.

The Blackfoot River far outranked all others in the drainage for wildlife species and habitat quality. Outstanding units include the North Fork of the Blackfoot, the Blackfoot main stem and west side tributaries from the North Fork to the Clearwater, and the entire Clearwater drainage. Reasons include the upper Blackfoot's pristine riparian habitat, ability to support high numbers of breeding and wintering eagles, grizzly bear habitat, and abundant populations of wintering big game. Cottonwood forests and meandering river channels with abundant wetland and spring creeks provide habitat for nesting ospreys, great blue herons, wintering and migrating waterfowl, and river otters. The DFWP has secured about 50,000 acres of critical big game winter range along the Blackfoot and Clearwater rivers.

From the Clearwater River to its mouth, the Blackfoot earned a Class I fisheries final resource value due to an abundance of rainbow trout, mountain whitefish, and trophy-sized bull and brown trout in a setting of outstanding natural beauty. Five tributaries, essential spawning habitat for the Class I sport fishery, received a Class I habitat and species value. The Blackfoot main stem from Arrastra Creek to the Clearwater was a Class II sport fishery.

Bordered on the west by the Bitterroot Mountains and on the east by the Sapphire Mountains, the Bitterroot River drains the Selway-Bitterroot Wilderness, flows north for 84 miles, and joins the Clark Fork just below Missoula. Class I wildlife values were assigned to the Bitterroot main stem between the East and West forks, and to Lolo Creek, for its wetlands, cottonwood forests, and islands that provide essential habitat for bald eagles, colonial nesting birds, ospreys, and waterfowl. The Lee Metcalf National Wildlife Refuge protects much of the excellent habitat along this stretch.

More than half of the 868 stream miles rated in the Bitterroot River drainage received a Class II fisheries final resource value, and 33 miles received a Class I final resource value, because of pure westslope cutthroat trout populations. The entire Bitterroot main stem is a Class II sport fishery and, in 1985, received the fifth highest fishing pressure in Montana. In addition, it provides an outstanding experience for floaters in everything from inner tubes to wooden dories. The recreational resource has been diminished by irrigation in the Bitterroot Valley south of Hamilton, and this dewatering also has caused fishery habitat loss.

Three proposed Research Natural Areas (RNAs), totaling 5,679 acres, are located within Lost Horse Canyon, on a tributary of the Bitterroot River. Other RNAs include the 257-acre Plant Creek RNA, south of Missoula and representing one of the few remaining patches of lower elevation undisturbed old growth western larch and Douglas-fir, and Sheep Mountain Bog RNA, a sphagnum moss bog believed to be home to the northern bog lemming, a scarce and locally distributed vole, probably the rarest and least known inhabitant of the upper Clark Fork River drainage.

Lower Clark Fork Drainage

Boundaries: Bitterroot River to Idaho border
Drainage size: 22,073 square miles
Main stem length: 200 miles
Tributaries: St. Regis, Flathead, Thompson
Cities/towns: St. Regis, Plains, Thompson Falls
Access: Interstate 90, Montana Highways 135 and 200

From a car window or train boxcar, one can see most of the 200 miles of the lower Clark Fork River as it snakes through forested foothills, grasslands, narrow canyons, and broad cottonwood-lined river valleys en route to Idaho's Lake Pend Oreille. With an average flow of 21,000 cubic feet per second, the Clark Fork is Montana's largest river. The relatively few remote miles on this stretch—most notably Alberton Gorge west of Missoula—can be experienced firsthand in a rubber raft or kayak.

Because of its integration with civilization, the lower Clark Fork River is another drainage of diverse resource uses. Paper mill effluents, municipal sewage, past mining and logging activities, and construction of three dams have degraded wildlife and fishery habitat and diminished the Clark Fork's recreational appeal. Man's heavy imprint upon the land resulted in the lower Clark Fork River drainage receiving few outstanding ratings in the Montana Rivers Study. Scenic quality, for example, was rated Class I or II on only 3% of the 1,350 miles of rivers and streams assessed for recreation—likely a reflection of conflicting land uses.

Although the study revealed abundant access that typically goes with development, recreational use was relatively low overall compared with other western Montana drainages. Picnicking, camping, and non-motorized trail use were the

The lower Clark Fork is a river of many moods; the quiet water of Noxon Reservoir (below) contrasts with the frothing whitewater of Alberton Gorge (below right). This drainage supports critical habitat for many big game species, including white-tailed deer (right).

MIKE ADERHOLD

RICHARD MOUSEL

DIANE ENSIGN

most popular activities. Boating ranked even higher, perhaps because the lower Clark Fork River drainage has a large supply of major whitewater, including Alberton Gorge, outstanding on both the geologic and recreational scales. As the river cuts through pre-Cambrian bedrock, the channel is pinched between nearly vertical walls, creating major rapids with imposing names like Tumbleweed and Fang. By far the most popular water activity on the lower Clark Fork River was shore fishing. The main stem between Missoula and Superior, 105 miles accessible from Interstate 90, had the 11th heaviest estimated stream fishing pressure in the state in 1985; yet the section has been found to have relatively low numbers of trout for a river its size. A scarcity of high-quality spawning habitat in the main stem and tributaries may be limiting catchable trout.

The Montana Rivers Study assessed 1,176 miles of fisheries in 206 reaches in the lower Clark Fork River drainage. Only 1% of the reaches received a Class I final resource value, the lowest number of outstanding reaches of the 12 drainages. Four reaches totaling 140 miles received a Class II in the sport fishery value—two reaches of the Clark Fork main stem between the Bitterroot River and the Flathead River, the lower 26 miles of the Thompson River, and the lower 14 miles of Fish Creek.

Historically, the fisheries of the lower Clark Fork depended on the annual spawning migrations of cutthroat trout, bull trout, lake whitefish, and kokanee from Lake Pend Oreille, while the resident fishery was considered generally "unproductive." Access by migrating populations to the lower river was lost with construction of Thompson Falls and Noxon Rapids dams in Montana and Cabinet Gorge Dam in Idaho. Together, the three dams impound 70 miles of river in Montana. Fisheries mitigation schemes, including stocking programs totaling nearly 10 million fish of eight species, have been funded in part by the Washington Water Power Company.

Although dams, highways, and railroads have diminished the riparian wildlife habitat of the lower Clark Fork River, an important exception is Council Grove, a 400-acre wetland and forested area just west of Missoula. Popular with bird-watchers and home to a rare plant called the pointed broom sedge, Council Grove is a Class I natural feature and a proposed USFS Research Natural Area.

Large populations of and critical habitat for white-tailed and mule deer, elk, black bears, moose, bighorn sheep, mountain lions, beavers, lynx, bobcats, and martens earned nearly three-fourths of the tributary wildlife units in the lower Clark Fork River drainage a species rating of Class I or II. Grizzly bear habitat in the Cabinet/Yaak ecosystem and critical bald eagle nesting and wintering areas also were important factors. Tributaries with outstanding species values include Fish Creek and the Bull and Vermilion rivers. The Bull River, from its headwaters in the Cabinet/Yaak Wilderness to its confluence with the Clark Fork River near Noxon, also received an

outstanding habitat value. Its meandering floodplain of wet meadows, bogs, and backwater sloughs is a unique resource in a basin with extensive impacts to most riparian areas. It's apparent that what the Clark Fork main stem lacks in wildlife values is balanced by high species and habitat values along the tributaries.

Big Hole and Beaverhead River Drainages

Boundaries: Headwaters to Jefferson River
Drainage size: 6,381 square miles
Main stem length: Big Hole, 156 miles; Beaverhead, 211 miles
Tributaries: Red Rock River, Horse Prairie Creek, Ruby River
Cities/towns: Dillon, Jackson, Lima, Melrose, Twin Bridges, Wisdom, Wise River
Access: Interstate 15, Montana 41, 43, and 278

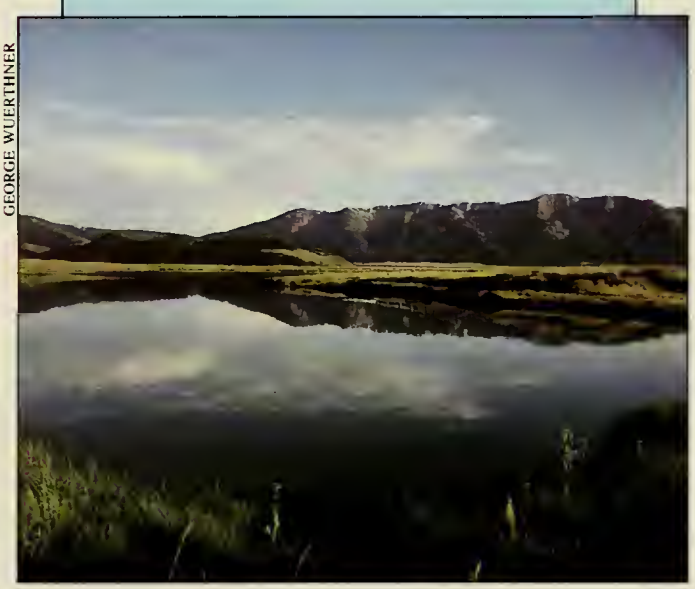
The Continental Divide borders the southwestern corner of Montana on three sides. In this remote region, eight mountain ranges and the high, windswept, sage-covered valleys separating them collect heavy snowfall, supplying the Big Hole and Beaverhead rivers, which merge at Twin Bridges to become the Jefferson River. Elevations vary from the 11,000-foot summits of the Pintlars down to 4,600 feet where the Jefferson is born. The longest continuous watercourse in the United States begins in Hell Roaring Canyon, a tributary of the Red Rock River.

The Big Hole and Beaverhead rivers share a common destination and some of Montana's best fisheries, wildlife, and recreational values, but there the similarities end. In the Big Hole drainage, sandhill cranes and the rare Arctic grayling still find niches, hay is put up using "beaver slides" (an old method no longer used in most parts of the state except southwestern Montana), and cattle outnumber people 100 to one. The river's journey to Twin Bridges is uninterrupted by any major dams, unlike the Beaverhead River, which is

DAVE BOOKS

Because it offers some of Montana's finest brown and rainbow trout fishing, the Big Hole River (above) is a favorite of non-resident anglers. Red Rock Lakes National Wildlife Refuge (below) consists of 40,000 acres of undisturbed lakes, marshes, grasslands, and forests.

GEORGE WUERTHNER



captured in Clark Canyon Dam near its origin at the confluence of the Red Rock River and Horse Prairie Creek. Highway and railroad crossings contribute to a lack of solitude along the Beaverhead, and irrigation withdrawals on the lower reaches have reduced scenic and fisheries values.

The Big Hole and Beaverhead drainages contained nearly one-third of the outstanding recreational river mileage statewide. The recreational value of the drainages overall was rated

Class I and II for 790 of the 1,800 assessed miles. Scenery, good hunting, fishing, and access to wilderness were the top reasons for favorable ratings, while logging clearcuts and restricted access due to private land ownership diminished the recreational opportunity. It's not surprising that fishing from shore was a primary activity on 76% of the mileage assessed for recreation. The drainage has 71 miles of Class I sport fisheries.

Few rivers surpass the upper Beaverhead's angling opportunity for trophy-sized brown and rainbow trout. It produces more large trout per mile than any other stream in the state. Captain Meriwether Lewis was probably first to document this when he wrote that his party landed "528 good fish, most of them large trout" the evening of Aug. 22, 1805. The upper 12 miles of the Beaverhead down to Grasshopper Creek were rated Class I in the sport fishery value.

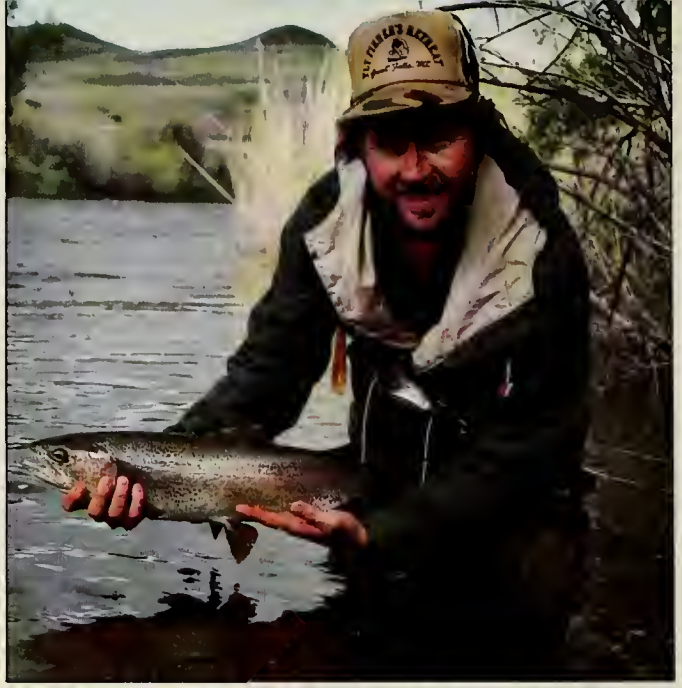
The 59 miles of the Big Hole River from Wise River to its mouth has been recognized as a "blue ribbon" trout stream or a Class I sport fishery since the first river classification in 1959. Below Divide, the river enters a canyon, where trophy brown and rainbow trout find habitat in deep holes abutting limestone cliffs. Among southwestern Montana streams, this stretch supports non-resident angler use second only to the Madison River.

While the lower Big Hole received a Class I final resource value due to its outstanding sport fishery, the river above Wise River received a Class I because of its river-dwelling Arctic grayling population. Still abundant throughout Canada and Alaska, river-dwelling grayling are thought to be extinct in the lower 48 states except for 10 streams in the upper Big Hole drainage. Catch and release fishing regulations to protect this species and renewed effort to identify the grayling's remaining range and habitat requirements are being undertaken by the DFWP and the Beaverhead National Forest.

Of the 1,423 miles of stream in 190 reaches assessed for fisheries value in the Big Hole and Beaverhead drainages, 40% of the total stream miles carried a substantial sport fishery value; a majority of these miles supported productive small-stream fisheries, where brook, cutthroat, or rainbow trout were abundant.

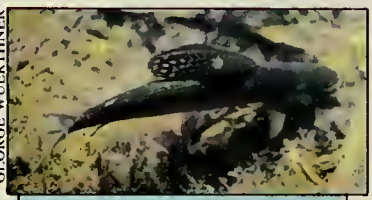
From the blue ribbon waters of the Big Hole River to the high marshlands of the Red Rock Lakes National Wildlife Refuge, rivers in southwestern Montana support abundant big game populations and provide critical habitat for threatened or endangered species and other species of special concern. All but one of the 18 wildlife units assessed in the Big Hole and Beaverhead drainages received a final value class rating of I or II. The lower braided 50 miles of the Big Hole River and 30 miles of the Beaverhead below Dillon are composed of mature cottonwood forests, islands, wetlands, and backwater channels that provide habitat for great blue herons; ospreys, bald eagles, and other raptors; waterfowl; and river otters. Largely untouched tributary basins of the Pioneer Mountains south of the Big Hole also received Class I species quality ratings, as did upper Horse Prairie Creek.

The Centennial Valley, one of Montana's highest and least developed valleys, provides a great diversity of habitat for wildlife, including long-billed curlews, sandhill cranes, trumpeter swans, recently reintroduced peregrine falcons, prairie falcons, and bald and golden eagles. The lower Red Rock River received one of the highest game species scores in the state because its tributaries support outstanding populations of



CONRAD ROWE

STEVE SHELLY



GEORGE WUERTHNER

The Beaverhead River (top) is unsurpassed as a trophy trout fishery. Southwestern Montana is home to several rare plants, including the Lemhi beardtongue (left), and to the only remaining river-dwelling grayling (above) in the lower 48 states.

10 game and furbearing species.

The 40,000-acre Red Rock Lakes National Wildlife Refuge, consisting of relatively undisturbed lakes, marshes, bogs, grasslands, and both deciduous and conifer forests, is a prime example of a designated ecological natural landmark. The refuge is one of the 18 natural feature sites in the Big Hole and Beaverhead drainages that received a Class I or II value.

Due in part to its geographic isolation among high, dry mountain ranges, southwestern Montana is botanically unique. This region, in fact, is considered one of the richest areas of the state for rare plants. Among them are the Bitterroot milkvetch and the Lemhi beardtongue, regionally endemic species recommended for protection by the Montana Rare Plant Project.

This region is geologically significant as well. The folding and faulting processes that occurred as the Rocky Mountains were formed are evident in the Block Mountain area on the Big Hole River north of Dillon. Well-preserved fossil insects have been found in the Ruby Reservoir area. And the spectacular, tall, reddish pinnacles of the Humbug Spires Primitive Area are frequented by rock climbers, further enhancing the recreational potential of the Big Hole and Beaverhead drainages. ■

* * * * *

• *Part Two of the Montana Rivers Study, "Here's to the Rivers!" will appear in the July/August issue.*—Ed.

READERS RESPOND

Chock-full of Wondrous Nature

You have outdone yourselves with the Jan./Feb. 1988 Special Photo Issue. It is a joy to behold. Other states like Illinois and Washington could certainly take a lesson from you.

Thank you for a beautiful issue.—*Mrs. Tobi Van Dyck; Chicago, Ill.*

* * * * *

Your Jan./Feb. 1988 issue is so beautiful. I don't know which is more so—the photos or the haiku, which is why I need an extra copy for my daughter who is principal at an elementary school in Louisiana. She loves to teach and compose poetry, and haiku is one of her favorite forms.—*Virginia Franks; Shreveport, La.*

* * * * *

I have just received my Jan./Feb. 1988 issue of *Montana Outdoors*. You have done better than your usual great job!—*Dick Heiler; Altoona, Pa.*

Update on Alberta Bighorns

I would like to comment on some information in "Bighorns on the Rise," which appeared in the Sept./Oct. 1987 *Montana Outdoors*. There is a statement to the effect that a strain of viral pneumonia wiped out "70% to 80% of the sheep" in Alberta "where the die-off started."

During the summer and fall of 1982, a large-scale die-off of the Yarrow Creek-Westcastle bighorn sheep herd in southwestern Alberta resulted in losses of approximately 60% to 70% of this herd, estimated at 400 to 450 animals. The die-off was confined to the area south of the Crowsnest Pass in Alberta. It appears this die-off was a continuation of the epidemic that started in British Columbia in December 1981 where losses of 80% of the population in the areas affected have been reported. Alberta's bighorn sheep population numbers about 6,000 animals, so the die-off in southwestern Alberta affected less than 5% of the Provincial population.

Recovery of the bighorn sheep population in southwestern Alberta has been slow as overwinter mortality of lambs has been very high. The pathogen is still present and has continued to kill the least resistant segment of the population.

I hope the above information helps to set the record straight. I enjoyed the article by Tom Palmer and would like to commend the Department of Fish, Wildlife and Parks for its excellent bighorn sheep management program.—*Duane S. Radford, regional director, southern region, Alberta Forestry, Lands and Wildlife; Lethbridge, Alberta*

Birds of Prey—Outstanding

Please continue featuring the wildfowl of Montana. I want to compliment you on the excellent artist's renderings and the well-documented article on birds of prey in the Nov./Dec. 1987 issue. Game birds and waterfowl would be excellent subjects for similar treatment in future issues.

ALL BOOKED UP??

MO's binders will ensure less of a mess

Order yours today—just $6, prepaid, from MONTANA OUTDOORS, Department of Fish, Wildlife and Parks; Helena, MT 59620.

I am a carver of birds in wood, and your magazine has provided some very good reference pictures for my hobby.—*Walt Mifflin; Glen Ellyn, Ill.*

• *We have published special sections on game birds and waterfowl. "Waterfowl Scenes for Framing" appeared in the Nov./Dec. 1977 issue, and "Identification of Montana's Upland Game Birds" appeared in Sept./Oct. 1982. Both magazines are still available, at $1.75 each. To order, contact: Back Issues,* Montana Outdoors, *Department of Fish, Wildlife and Parks, 930 Custer Avenue West; Helena, MT 59620.*—Ed.

Wanted: Back Issues

Having checked my library of *Montana Outdoors*, I find I lack the following issues: Vol. 1, No. 1 (Nov./Dec. 1970); Vol. 2, Nos. 1 and 2 (Jan./Feb. and March/April 1971); and Volume 3, Nos. 1, 2, and 3 (Jan./Feb., March/April, and May/June 1972).

Can you recommend a source or a means of locating the issues noted above? Perhaps mention in the magazine might do the trick?—*Donald W. Becklin, 2012 Hillcrest Road; Medford, Ore. 97504*

• *We no longer have the issues Mr. Becklin requests. If you can help, please contact him at the above address.*—Ed.

Missing Montana

A small note to express my appreciation to you folks for helping me keep in touch with the beauty and beliefs we all share as Montana outdoorsmen. The last issue I got, Nov./Dec. 1987, contained many breathtaking and memorable photographs.

You see, I've been away from the beautiful state of Montana for five years now, doing my part on a submarine for the U.S. Navy. My *Montana Outdoors* magazine keeps me in touch with the special feeling most people have who have experienced the physical and mental beauties provided by Montana's environment. Believe me, you miss things most when you are far from them.—*Gary L. Cooper; USS Trepang*

Part of the Natural World

continued from page 9

the information generated by the annual Christmas bird counts.

Prairie Dog Management

The possibility of black-footed ferrets becoming available for transplant into Montana (see "Wanted: The Masked Stranger," *Montana Outdoors*, July/August 1987) has demonstrated a need to develop plans on how best to manage prairie dogs to accommodate ferret reintroduction. Ferrets are only one part of the prairie dog ecosystem. But prairie dogs are also something of an anathema to livestock producers. How, then, can prairie dogs be managed to simultaneously maintain species richness and representative ecological relationships, while reducing their impacts on key rangelands? We may never achieve an ideal answer, but through implementation of sound management recommendations, it should be possible to improve the status of certain grazing lands and still accommodate associated species at some sites. The nongame program is involved in interagency deliberations on how best to tackle this sticky problem.

Supported Studies

Each year, independent studies come to the attention of the nongame program staff, or an investigator submits a request for funding. With limited dollars, support for worthy projects often comes in the form of equipment loans, transportation, or a few days of contributed manpower. But occasionally, the nongame program may provide $200 to $500.

The Nongame Wildlife Program has supported two studies:

• **Montana Loon Survey**—A statewide survey of common loon nesting in Montana has been under way for some time. Don Skaar has compiled information on distribution, nesting success, and disturbance factors, and will soon produce management guidelines for this species (see "Seeker of Solace," *Montana Outdoors*, March/April 1987). The nongame program has provided financial and equipment support for this study, which has also received assistance from the North American Loon Fund and the U.S. Forest Service.

• **Valley of the Eagles**—Each spring during migration, large numbers of bald and golden eagles, as well as other raptors, follow the Shields River valley north. Dr. Al Harmata traps and bands eagles, as well as analyzes blood samples, each spring near Ringling. The nongame program has provided field assistance, equipment, and funding for vehicle mileage and blood sample analysis.

Prairie dogs

Other Tasks

As is usual with almost any program, many tasks are not major, but when they're added together, they take up a significant amount of time. Following are a few highlights from the current year:

• **Montana Bird Distribution**—This is Montana's "bird atlasing" project, designed to record distribution and status of all bird species in Montana. It is a follow-up to the late P.D. Skaar's work, with the latest edition co-authored, printed, and distributed by the nongame program. Future addenda are planned.

• **Writing**—The nongame program staff prepares many articles (such as this one), pamphlets, presentations, and news items. Scheduled writing is an ongoing part of the program.

• **Nongame Newsletter**—For the first time, the nongame program staff will issue a newsletter three times a year to provide the public with information on

Common loon

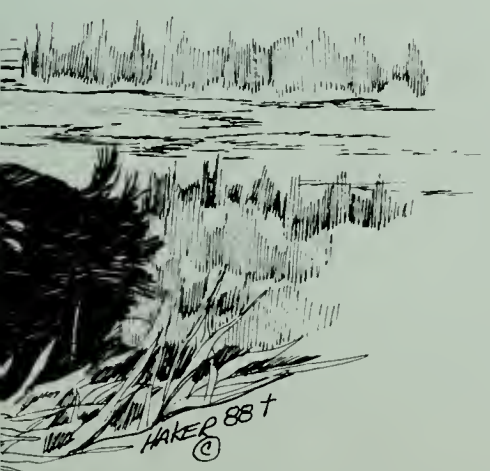
items of interest. If you wish to be on the mailing list, contact the DFWP at 1420 East Sixth; Helena, MT 59620.

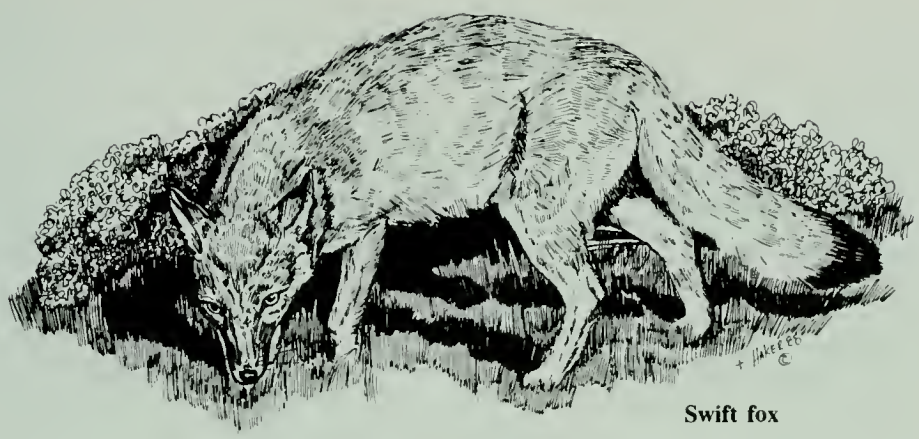
• **White-tailed Prairie Dog Excavation**—The underground life of burrowing mammals is poorly understood, despite studies over the years. As one biologist observed, "When a prairie dog dives down a hole, all data collection stops!" In an effort to learn more about this species and to better understand management options, researchers have excavated a burrow system in Carbon County with a backhoe. Besides the nongame program, other participants included the Provincial Museum of Alberta, the U.S. Bureau of Land Management, and BIOTA Research and Consulting.

• **Shorebird Reserve System**—The nongame coordinator serves as Montana's representative to the Nongame Committee of the International Association of Fish and Wildlife Agencies for the purpose of coordinating a hemispherewide system of shorebird reserves. Shorebird reserves are unique sites which host concentrations of migrant shorebirds. Those with at least 25,000 migrant shorebirds are designated "regional reserves"; Montana has two: Benton Lake and Freezout Lake.

Miscellaneous Activities

This is another catchall category which includes too many topics to list. Some current highlights include: surveying the red-necked grebe, coordinating management of right-of-way habitats with other states, and reviewing and monitoring the status of the white pelican.





Swift fox

Coming Up

But that's not all. Here are previews of coming attractions:

• The nongame program staff will conduct heron and cormorant surveys along the Yellowstone River this year. Volunteers will be asked to assist in identifying areas of key use and monitoring the status of colonies.

• The nongame program staff will develop nongame species inventories at key sites along the Yellowstone River. Initially, wildlife management areas will be the focal point of these surveys. But we plan a long-term environmental monitoring system using nongame species as indicators.

• Challenge grants, which provide operations expenses to investigators willing to contribute manpower, will be available for researchers who wish to study a particular species which can't be addressed with existing manpower. Species like the upland sandpiper and mountain plover are likely subjects.

• Swift fox reintroduction may become a reality. For decades, the swift fox has not been seen in Montana. A proposal by personnel at the Charles M. Russell National Wildlife Refuge has suggested return of this prairie dweller, and the nongame program serves as the department's coordination point.

Right now, the nongame program is staffed by one person. It is only through a wide network of cooperators and liaison with other agencies that so many tasks can be addressed. Even so, it is not possible to monitor all species throughout Montana's 93 million acres. Consequently, current activities focus only on those species most in need of attention.

What can you do? If you forgot to say yes to the nongame checkoff on your 1987 Montana income tax form, or if you decide you want to contribute directly, you can do so through the DFWP office in Helena. Over the past four years, $6,763 has been generated through direct contributions.

Help keep the momentum going—our nongame wildlife heritage depends on you.■

Northern harrier

CONTRIBUTORS

• The goat study on the Rocky Mountain Front began because researchers knew very little about the herd and because disturbance and development of goat habitat in other places has often resulted in population declines. As **Gayle Joslin** writes, "Mountain goat country...is not as remote and inaccessible as it once was. Unfortunately, where security has been reduced, mountain goat populations have generally declined." Turn to "Life on the Edge" on page 2. Joslin has worked for the Department of Fish, Wildlife and Parks for 12 years; she is currently the Helena area wildlife biologist.

• It's a "given" that nongame wildlife is "Part of the Natural World." But as **Dennis Flath** writes, "More and more, we look to Montana's nongame wildlife...as a contributor to the quality of life cherished by Montanans and visitors to the state." Beginning on page 8, Flath summarizes and updates information about Montana's Nongame Wildlife Program. He is the department's nongame coordinator.

• **Diana Haker** makes it a point to study animal behavior in great depth as she is hunting, fishing, or camping. She tries to give the viewer a glimpse of how animals live, an accurate picture of a wild and natural setting. When you see her illustrations for Dennis Flath's article, we think you'll agree she's met her goal. Her work has appeared previously in our pages, and in many other magazines, including *Safari, Fins & Feathers, Western Outdoors*, and *Bowhunter*. For more information, contact her at P.O. Box 14; Worden, MT 59088 (406/967-2727).

• It's been a successful day on your favorite trout lake, and you're looking over the day's catch. The rainbow trout in your creel may be part of a new trout management program. Turn to **Dick Vincent's** article, "The New Rainbows" on page 10. Vincent is a fisheries biologist with the department—he's worked for 22 years in Region 3 (Bozeman), and he wholeheartedly believes that wild strains of rainbow trout may lead to better fishing in some cold-water lakes and reservoirs.

• "Here's to the Rivers!" And how deserving of that toast they are. People salute rivers for many different reasons, and some believe that any attempt to measure, prioritize, or rank them is a desecration. But facts and figures can also be a valuable tool should development threaten them. Enter the Montana Rivers Study (MRS), the results of which occupy 12 pages in this issue; Part Two will appear in July/August. **Janet Decker-Hess**, project manager and writer of the fisheries sections, notes the study would not have been possible without help from personnel of the DFWP, Department of Natural Resources and Conservation (DNRC), U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Geological Survey, The Nature Conservancy and its Montana Natural Heritage Program, and universities and museums. Decker-Hess has been a fisheries biologist with the department since 1979, heading fishery research projects in Dillon and Kalispell. She began working on the MRS in 1985 and has managed the project since fall 1986. **Sally Hilander** undertook the massive project of editing a tall stack of technical documents into a two-part series for *Montana Outdoors*. Due to her love of outdoor recreation, Hilander moved to Helena from Colorado in 1976 and was an environmental reporter for the Independent Record for nearly 10 years. She is now a self-employed writer and editor. Since 1984, **Gael Bissell** has conducted wildlife mitigation research as a DFWP biologist on projects underwritten by the Bonneville Power Administration and the Montana Power Company. She conducted the wildlife assessment for the MRS in 1985 and has recently returned to the project. While pursuing his goal of floating every river in the western United States at least once, **Stewart Allen** has found time to earn his Ph.D. in recreation management from the University of Montana, work for DNRC for five years, and conduct numerous recreational research projects. He is currently a visiting assistant professor at the University of Idaho. **Tom Ring** has worked as an environmental specialist with the Energy Division of DNRC for more than six years. Larry Thompson, to whom these rivers articles are dedicated, and Ring were the team which conducted the natural features assessment for the MRS. **Nancy Johnson**, a landscape architect with the Energy Division of DNRC since 1983, helped with the geologic features assessment and final report. Trained as a wildlife biologist at the University of Montana, **Susan Reel** has conducted numerous research projects on nongame birds and animals. Recently, she has begun a career in natural history writing. Reel, with the help of Peter Lesica, who conducted the original assessment of natural features for the MRS, wrote the natural features portion of the final report after Larry Thompson became ill. Join in the salute to Montana's free-flowing treasures; turn to page 19.

• Wild Horse Island is a unique state park. First, it's the largest island in the largest freshwater lake west of the Mississippi. Second, the island has many ecological features that warrant monitoring, as **Terry Knupp's** article emphasizes. Knupp is the parks manager for Region 1 (Kalispell). Turn to her article, "Wild Horse Island: Recommitment to Preservation," on page 36.

• **Susan** and **Richard Harness** remind you that the Lee Metcalf National Wildlife Refuge is "A Sight Worth Seeing." From red-winged blackbirds to Canada geese to a quiet, green spot for a picnic, the refuge has much to offer. To Susan, a free-lance writer, the refuge holds special significance: Her father, Ged A. Devan, was the original refuge manager, and her family lived there for five years. Richard is an environmental specialist with an electrical consulting firm. They live in Fort Collins, Colorado, and their contribution to this issue begins on page 40.

• *Montana Outdoors* continues its "Perspectives" series on page 42 with the finely honed words of **Paul Zarzyski**. His words are a sparkling addition to any issue in which they appear, and "The Antler Tree" follows that tradition. Zarzyski is currently writing in New Mexico; he has taught poetry at University of Montana and has written two collections of poetry, "Call Me Lucky" and "The Make-Up of Ice."

• Illustration for "The Antler Tree" was especially prepared by **Mike Hollern**. Hollern is a printmaker and sculptor of wildlife who is also a hunting and fishing buddy of Poet Zarzyski. A Montana native, he makes Great Falls his home. His work has appeared in *MO* several times, and he is a favorite at local Ducks Unlimited auctions and the Charles M. Russell Art Auction. For more information, contact him at Box 1; Great Falls, MT 59403 (406/727-1754).

• "Data, Dollars, and a Deed" pretty well sums it up. The Nature Conservancy gathers the information, secures the bucks, and the next thing you know, they have in hand the deed to a couple of hundred—or thousand, or more—acres of crucial wildlife habitat. Their record makes you stand up straight: This private, non-profit, scientific, and educational organization has managed to protect over 3 million acres of precious habitat nationwide—and that's just over the last generation. The Conservancy's "chief push" in Montana and Wyoming is Big Sky Field Office Director **Bob Kiesling**, who also wrote our article. See what he has to say, beginning on page 44.

• *MO* wishes to thank the many, many photographers who helped make this issue of the magazine a salute to Montana's outdoors.

NONGAME NEWS

NONGAME SYMPOSIUM

Montana's Fourth Annual Nongame Symposium was again conducted in conjunction with the annual meeting of the Montana Chapter of The Wildlife Society. Fifty-two representatives of state and federal agencies, universities, private industry, and conservation groups attended the February meeting in Lewistown. The symposium's focus was on nongame wildlife in eastern Montana; it included two sessions devoted to technical papers and a concurrent poster session.

Mark Gorges of the Bureau of Land Management (BLM) in Miles City discussed the status and distribution of the blue jay. Almost all records are in winter, from such diverse locations as Malta, Butte, Helena, and Hamilton. Although there are a few records in summer from the northeastern and southeastern corners of the state, only one breeding record exists (from near Broadus in 1978). Work still needs to be done to verify the breeding status and seasonal distribution of the blue jay in Montana.

Jim Roscoe discussed BLM studies of riparian (streamside) vegetation and breeding bird responses to grazing systems in southwestern Montana. In many cases, the overstory vegetation and breeding birds in riparian areas are lost completely to intense grazing pressure. Experimentation with rest-rotation systems, in which such areas aren't grazed during the hottest seasons, have had some success in rehabilitating riparian areas and the birds that breed there.

Dr. Jay Kirkpatrick of Eastern Montana College (EMC) presented results of his studies of a new technique to determine pregnancy rates in wild horses (in the Pryor Mountains). The technique is based on analysis of hormone levels in urine, and it can be used without capturing animals. The technique is becoming increasingly popular in studying both game and nongame animals. Three students from EMC discussed a study of pikas in which they used similar techniques to assess reproductive cycles and stress.

Dennis Flath, nongame biologist for the Department of Fish, Wildlife and Parks, discussed excavation and measurement of a white-tailed prairie dog burrow complex in Carbon County. This was the most complete excavation ever undertaken, and it shed light on some of the ways this species copes with life underground. The large complex of tunnels included what appeared to be maternity areas, hibernation chambers ("hibernacula"), and numerous plugged tunnels. Researchers found that burrow systems were convoluted and dynamic, even in areas where surface features showed little variety.

John Grensten of Malta has studied mountain plovers on the Charles M. Russell National Wildlife Refuge (CMR) and nearby, and he reported that plovers show a strong affinity for prairie dog towns on the CMR. They nest in areas with sparse vegetative cover (including hardpan), but often near things like small rocks or cow pies, which they use for shade. He noted plovers tend to return to the same area year after year to nest.

Chuck Carlson, noted birder from Fort Peck, summarized the 18 species of the gull family (Laridae) which have been seen on Fort Peck Reservoir and the open water of the Missouri River immediately downstream. These include 12 species of gulls, five tern species, and the pomarine jaeger. Eight of the species, including the glaucous, Iceland, ivory, and black-legged kittiwake gulls, are Arctic nesters which show up rarely in Montana as migrants or winter visitors. The most unusual local nesters are the Caspian and least terns which nest on islands in the reservoir. The 1987 nesting attempt of the latter species, recently listed as threatened by the U.S. Fish and Wildlife Service (USFWS), was the first for Montana. Carlson and other symposium participants noted that a more intensive search for nests should be conducted in suitable nesting habitat downstream along the Missouri River.

Pika
JAN BONHAM METZMAKER

Another federally listed threatened species, the piping plover, was the focus of intensive nest searches in Montana in both 1986 and 1987. Steve Martin of the Medicine Lake National Wildlife Refuge said a total of 35 nests was found during the two years, mostly on the refuge and surrounding wetlands. Nesters were also found at Fort Peck and Nelson reservoirs, with non-nesters at Bowdoin National Wildlife Refuge. Known production was 23 young in 1986 and from 24 to 31 in 1987. Researchers found that plovers nested mainly on wide beaches with flat surrounding topography, beaches with large, white rocks, or peninsulas. Such habitats make nests susceptible to water level fluctuation, off-road vehicle use, grazing impacts, and predation.

David Genter of the Montana Natural Heritage Program discussed the former distribution and abundance of the swift fox in Montana. Predator control and competition with the coyote apparently wiped out this smallest North American representative of the dog family (Canidae) throughout much of its former range in the Great Plains. Only three records of the swift fox from southeastern Montana have been verified over the past 15 years. The species is still common in areas of Wyoming and Colorado, however, and Alberta and Saskatchewan have begun captive propagation and reintroduction programs. Similar efforts are being discussed in Montana.

Dennis Flath updated the accomplishments, ongoing activities, and upcoming projects of the Montana Nongame Wildlife Program (for details, see his article on page 8).

The symposium concluded with a panel discussion by representatives of the U.S. Forest Service, USFWS, National Park Service, and BLM regarding nongame issues, research, and management of nongame by federal agencies.

Wild Horse Island:

Recommitment to Preservation

by Terry Knupp

On the afternoon of Dec. 21, 1987, a chocolate-colored full-curl bighorn ram gracefully pranced up the mature ponderosa pine slope above Skeeko Bay on Wild Horse Island in northwestern Montana's Flathead Lake. The bighorn gained 200 feet in elevation in a matter of seconds, before disappearing over the ridge. He was followed by a similarly colored 2-year-old ram.

The arrival of both animals is significant for bighorn sheep management on Wild Horse Island. It is also an event which indicates recommitment by the Department of Fish, Wildlife and Parks (DFWP) to a preservation management philosophy for the 2,134-acre island state park. Simply put, a preservation management philosophy is the guiding ideal for determining agency actions taken to protect the island's natural and cultural resources.

Both animals began the day as part of the Ural Tweed herd, a group of bighorns living in the rocky cliffs of the Salish Mountains on the east side of Lake Koocanusa. These sheep are part of a project funded by the Bonneville Power Administration which aims to mitigate effects of hydroelectric facilities on fish and wildlife in northwestern Montana.

Department biologist Chris Yde captured the sheep in live traps and took them to Kalispell by truck. Veterinarian Charlene Owens sedated them, and weighed and measured them. She also took blood samples to enable her to detect disease and develop a genetic profile. For future identification, she marked their horns, tattooed their capes, and tagged their ears. Biologists wrapped the two sheep in protective netting, drove them to Flathead Lake, placed them in a fisheries research boat, transported them to calm Skeeko Bay, and released them on Wild Horse Island. The purpose was to assure diversity in the gene pool of the bighorn herd already on the island.

TERRY KNUPP

DAVE BENNETT

JoJo the Ram

Bighorn sheep first stepped onto the island in 1939, when two yearling

bighorns were introduced. They were reportedly captured as lambs in the Mission Mountains and raised by a woman in Hot Springs before release on the island. In the early 1940s, the original ram, JoJo, was photographed. He became something of a pet, performing antics like riding in a rowboat. He also charged through his reflection in a large glass picture window at the lodge operated by L. Penwell, owner of the island. Despite JoJo's antics, in 1947 Penwell petitioned the Fish & Game Commission to transplant six adult sheep (three ear-marked females) to the island. These sheep came from the Sun River Canyon herd on the eastern Rocky Mountain Front.

By 1951, the band of bighorns had increased to an estimated 38; by 1962, there were about 132. As the island's sheep population increased, several other herds around Montana were declining. From 1954 to 1959, department personnel trapped 47 sheep on the island and transplanted them to supplement other populations. But the population continued to increase, reaching a record 240 in 1972. So many sheep caused severe deterioration of the island's range.

Following a long-term effort to create a state park on Wild Horse Island, in 1977 the Montana Legislature authorized initial purchase of the land. Because over 60 sheep starved on the island during winter of 1977-78, the department live trapped and removed an additional 100 sheep in January 1979. Some went to other wild herds in Montana and some to research facilities.

The Wild Horse Island Management Plan, written in 1979, set the optimal maximum number of sheep on the island at between 50 and 75. From 1979 through 1986, the natural island grasslands started to recover from overgrazing. The sheep herd now numbers about 60 mature animals with an annual lamb crop of between 10 and 20.

After reviewing recovery of the island's forage, in 1986 the department recommended increasing the limit to 100 animals. Biologists also recommended maintaining diversity of the island herd's gene pool by occasionally adding a few sheep from a genetically unrelated herd. The Ural Tweed herd was selected. Department biologists will continue to observe and monitor these new sheep, as well as the rest of Wild Horse's sheep.

Wild Horse Island's bighorn sheep herd numbers about 60 mature animals, with an annual lamb crop of 10 to 20. The marked bighorn in the photo at upper left was one of two rams from the nearby Ural Tweed herd released on the island in 1987 to help maintain genetic diversity.

Park Management Policy

Wild Horse Island has been a state park since 1978. During its first 10 years, the park was managed under a "leave-it-like-it-is" policy. This direction came about because the department recognized the island had unique resources with no established patterns of public use and also from recommendations from a public planning task force.

Some recent history of the island will make the management strategies more understandable. Bourke MacDonald acquired the island in 1961. He began working with the DFWP to maintain the island's wildlife. He sold private lots on the island, and private cabins still dot the shoreline. When he died in 1973, his heirs wished to preserve the remainder of the island in a natural state. In a complex agreement involving the DFWP, The Nature Conservancy, the federal Land and Water Conservation Fund (LWCF), and the Montana Legislature, the family's wishes were guaranteed.

In 1978, the MacDonald heirs donated the initial 328-acre parcel for the park; the dollar value of this donation was matched by the LWCF. Since cost-sharing the park's appraisal of $3.5 million would have depleted the fund's ability to underwrite other recreation projects, the 2,134-acre island was split into seven parcels. Over the next six years, the department acquired the remaining six parcels, through donation and purchase with the LWCF. No state money was used. In the interim, The Nature Conservancy held ownership. The department has operated the entire island as a state park since 1978, except for the private lots.

In 1979, the department published the Wild Horse Island Management Plan which was written in response to surveys of public preferences and meetings of the Wild Horse Island Planning Task Force. Members of this group represent more than 10 organizations, including the Polson Chamber of Commerce; University of Montana School of Forestry; Flathead Wildlife, Inc.; Montana Department of State Lands; Lot Owners' Association; Polson Outdoors; Flathead Chapter of the Audubon Society; Lake County Planning Board; Lake County Commissioners; The Nature Conservancy; various DFWP management personnel; Ron MacDonald, son of Bourke MacDonald, and others.

The plan listed specific tasks for immediate accomplishment and adopted strategies for addressing resource issues such as facility development, sheep population levels, and others. Although this plan was updated in 1982, renewed interest in issues on the island prompted

the DFWP to call the task force together again in 1986. The group reviewed management strategies of the island from 1979-86. They concluded the management strategy was still valid, but recognized the need to plan for a time when use reached a level which required more stringent control.

During the new state park's first years, island visitors were encouraged to explore the island at random, after arriving at public landing beaches of their choice. There were no public recreation facilities or services such as a landing dock, latrines, or trails. From 1979-86, over 25,000 people recreated on the island. They came in a variety of crafts, including motorboats, sailboats, canoes, and catamarans. They enjoyed hiking, photography, picnicking, swimming, wildlife viewing, fishing, water skiing, and a variety of other activities.

In 1985-86, the department's island ranger, Barb Thomas, mapped daily landings, activities, and numbers of people on the island. She inventoried landing sites and common walking trails and set up a permanent sampling plot to document resource conditions. This will assist the department in detecting any harmful changes due to increased levels of human use.

However, information from the 1986 studies showed that human use was not damaging island soil, vegetation, or wildlife. Nor were conditions unpleasant for island visitors. However, the department and task force realized the value of scientific monitoring of island conditions. They recommended adoption of a modified "Limits of Acceptable Change" (LAC) system for the island. The U.S. Forest Service developed this system (through Dr. Steve McCool of the University of Montana) for evaluating issues and determining alternative actions to meet management goals in the Bob Marshall Wilderness complex.

In simplified terms, through the LAC system the public sets resource condition standards for particular wilderness zones. The agency monitors resource conditions and takes recommended actions to protect the standards when visitor impacts threaten them. This system will be modified over the next years to enable the department to apply LAC to Wild Horse Island management. The task force will help determine standards to indicate condition changes and direct subsequent actions.

What is so unusual about Wild Horse Island that it requires a complex resource monitoring system? It is the largest island in the largest freshwater lake west of the Mississippi. Wild Horse Island has many ecological features that warrant monitoring, including a relic Palouse prairie ecosystem (the original uncultivated western Montana grassland), a mature old growth Douglas-fir/ponderosa pine stand, two "endangered" plants (Spaulding's silene and Columbia River crazyweed). It also has unmarked terrain with no trails—a unique opportunity for scenery, solitude, and ambling anywhere on the island a visitor's interests might lead.

After the 1986 task force meeting, an overall philosophy set the tone for management decisions affecting the island's resources: *Wild Horse Island's natural qualities should be emphasized and conserved. The Palouse prairie and Douglas-fir/ponderosa pine forest ecosystems, rare plants, and present wildlife species should be preserved, and primitive, dispersed public recreation should be provided.*

While the management philosophy and decision to adopt a LAC system will be the primary management guide for the next few years, several other projects are under way:

Homestead Research

In the years since the island has been a park, many visitors have hiked to a saddle where remains of two buildings, reputedly from the homestead era, still stand. In 1905, Indians were permitted to claim land on the Flathead Indian Reservation (the island falls within the reservation's exterior boundaries). Only four Tribal members filed on Wild Horse Island. In 1910, after no further

MIKE ADERHOLD

Between 1979 and 1986, more than 25,000 people visited Wild Horse Island to hike, picnic, view wildlife, swim, and take pictures. Ranger Barb Thomas (below) holds Spaulding's silene, one of the island's two rare plant species.

MIKE ADERHOLD

allotments were claimed by Tribal members, the remaining island properties were opened to homesteading by white settlers via a lottery system. Only eight deeds were filed on the island between 1910 and 1915. Of these, only four parties claim to have constructed cabins and begun agricultural cultivation.

In 1986, the department sponsored a Green Thumb worker, Erika Nakamura, who began research to determine the historical value of the structures. (Green Thumb is a federally sponsored employment program for elderly workers.) Nakamura's extensive research included a review of county plat records and a National Archives search for homestead deeds, claims, and laws pertaining to homesteading. The records indicate the cabin and barn in the saddle of Wild Horse Island are those of Jim Johnson, a Norwegian immigrant who built them in 1911. The homestead was Mr. Johnson's permanent residence, with the exception of a few summer months in 1912-14 when he left the island to earn money for his personal needs and property improvement. The cabin and barn are the earliest surviving structures of the homestead era on Wild Horse Island.

Nakamura also took oral testimony from several individuals who spent time on Wild Horse Island in the early part of the century. Their testimony indicates that the homestead was used by other early homesteaders—Thurber, Tonkinson, and Powers. Jim McDonald may have helped with construction in return for grazing his cattle on the island in summer. Farming and ranching were "community efforts," with settlers sharing chores and facilities. The homestead claims were eventually sold to landowners interested in developing the entire island.

Since the surrounding landscape looks much today as it did when the homesteaders claimed their land in 1910 and 1911—including a view of uncultivated prairie grassland—island visitors have a unique opportunity to visualize the challenge facing early day Montanans attempting to homestead and survive on an island. With the help of the Green Thumb program, the department is seeking to have the cabins considered by the Montana Historical Society for inclusion on the National Register of Historic Places.

Volunteer Contributions

Since Wild Horse Island became a state park, volunteers have done their part. In an unusual kind of "volunteerism," a Polson judge "awarded" three juveniles a week's worth of labor on the island as restitution for a wildlife violation committed elsewhere. The three picked up nearly 100 bales of woven wire and metal fence posts strewn around the island. Later, 30 recreation students from the University of Montana School of Forestry loaded the bales on boats and ferried them to shore for disposal. Dr. Jeanette Oliver, botany professor at Flathead Valley Community College in Kalispell, has assisted in identifying plants and setting up a sampling plot to determine impact on vegetation of thousands of trampling feet. Members of the Lot Owners' Association have contributed their time for work projects such as noxious weed pulling.

Fire

Fire is part of the natural history of the Northwest, and in particular of the Palouse prairie grasslands. In the absence of fire, the Palouse prairie is steadily encroached upon by woody plants. Because of many years of fire suppression on Wild Horse Island, ponderosa pine seedlings have begun to take root on the grasslands, and Douglas-fir seedlings have regenerated in natural openings on the north side of the island. If the current policy of strict fire suppression continues, a greater portion of the island will eventually be in coniferous forest.

The department and the Wild Horse Island Planning Task Force recognize that maintenance of the Palouse prairie may require periodic burning. But this must be done under carefully controlled conditions, so that the lives and personal property of recreationists and private cabin owners are not endangered. Controlled burning would have the added advantage of reducing the heavy accumulation of natural fuels (dry grass, dead needles, and tree limbs) that has resulted from many years of strict fire suppression. If fuels continue to build to abnormally high levels, a catastrophic wildfire might eventually occur, jeopardizing some plants and animals on the island (including the rare plant, Spaulding's silene).

To examine these problems, the department has begun to prepare a fire management plan for the island. Several agencies have offered assistance, including the Stillwater State Forest, the Flathead National Forest, The Nature Conservancy, and the Bureau of Indian Affairs Fire Control Office. The plan will examine the fire history on the island (the last major burn was in 1964), consider other resource area fire plans already in operation, develop a proposed schedule and area for a possible controlled burn, and outline policies for fires in remote sections of the island that could possibly be allowed to burn under supervision until they reach a particular boundary. The fire plan will undergo public review and comment when it is drafted in 1988.

Recommitment to Preservation

Purchase of Wild Horse Island for a state park in the late 1970s was controversial. Debate continued as the department's management goals were developed. Keeping the island in its natural state—including no visitor facilities—does not accommodate intensive public use of the park. Although annual visitation has doubled since it became a park, it receives fewer than 10,000 visitor-days of use per year. Some who see the island as a greater contribution to the local economy would like it to be developed for more intensive use, including commercial concessions.

Wild Horse Island embodies some of the best of the unique natural resources Montana has to offer. Recommitment to the philosophy of preservation by the department and the Wild Horse Island Planning Task Force is an initial stroke in a portrait of Montana's strong value for park resources. Wild Horse Island and its resources, available for future generations, will be the portrait's finishing touches. Management of the island is paid for by interest from the Parks Coal Tax Trust Fund. ■

RICK HARNESS

Indian paintbrush

NELSON KENTER

Snow geese

RICK HARNESS

American bittern

Lee Metcalf National Wildlife Refuge

A SIGHT WORTH SEEING

by Susan and Richard Harness

NELSON KENTER

NELSON KENTER

White-tailed deer

A red-winged blackbird sits on a swaying cattail stalk not far from us, melodically protecting its territory. Farther away, an osprey glides over the top of a dead snag. Something moves among the cattails near the water's edge. We can't see what it is, but we hear it scurry across the leaves. Must be a mouse. The calm water reflects the blue sky and the Bitterroot Mountains to the west. A flurry of wings shatters the stillness as a flock of Canada geese takes flight.

We have just entered the Lee Metcalf National Wildlife Refuge 25 miles south of Missoula and just east of Highway 93. Stevensville, two miles to the south, is the closest community. The refuge is bordered by the Bitterroot River on the west and the Eastside Highway on the east. The southernmost quarter of the refuge is open to the public for picnicking, hiking, and fishing. Hunting is allowed in certain areas in the fall. A county road traverses the southern half of the refuge, providing good access for sight-seeing, bird-watching, and photography.

Composed of 2,700 acres of wetlands, ponds, grassland, cropland, and forest, the refuge's primary purpose is to provide habitat for waterfowl. Originally called Ravalli National Wildlife Refuge, the name was changed in 1978 to honor the late Senator Lee Metcalf, respected Congressman and ardent conservationist from Montana.

Warm spring winds are blowing large, billowing clouds across the Bitterroot Valley. A squall has just passed through and is heading northeast, leaving the sky blue in the west. A red-tailed hawk circles slowly on an early thermal, scanning the ground for an unusupecting mouse or other small rodent. Herons and bitterns stand stoically among the cattails, occasionally dipping their heads to the water. Overhead, ducks and geese fly in graceful V's. Some waterfowl species stay at

NELSON KENTER

Canada goose

the refuge all summer nesting and raising their young, while others use it as a resting place during migration.

A small whitetail doe stands partially hidden in the trees along the road. She realizes we've seen her and bounds gracefully over a small tangle of weeds and out of sight. The pond to our left has become active; Canada geese and mallards are talking noisily. A muskrat swims hastily through the water, creating a silent V in its wake. It ducks beneath the surface and then reappears several yards away.

Through conservation efforts, many marshes have been preserved for waterfowl and other wildlife in recent years. The Lee Metcalf National Wildlife Refuge is a success story, an example of how wetland habitat can support diverse, abundant wildlife. Thanks to sportsmen who provide funding through purchase of federal duck stamps, the National Wildlife Refuge System will continue to support both game and nongame wildlife well into the future.■

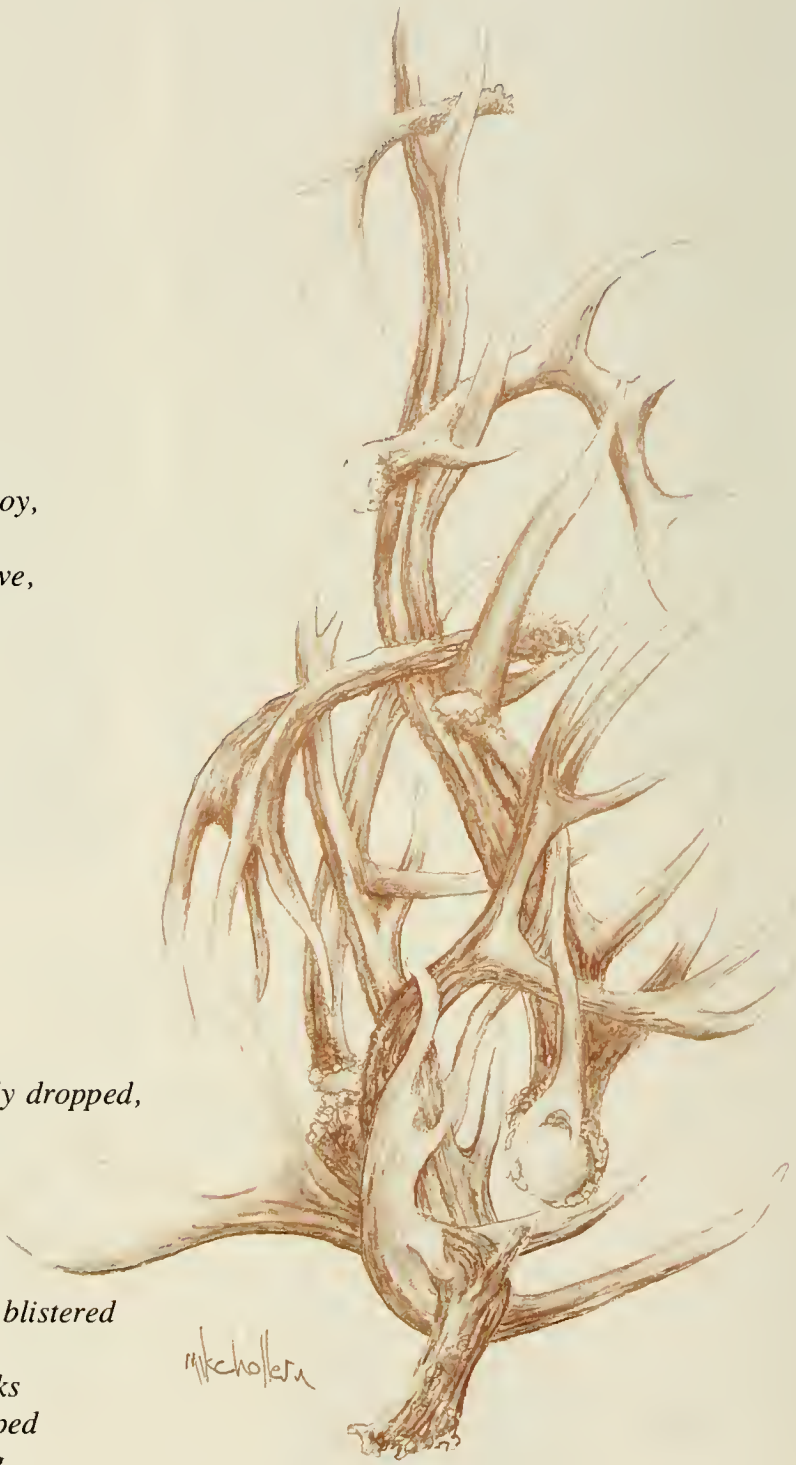
The Antler Tree

by Paul Zarzyski
illustrated by Mike Hollern

Late at night I braid the helix
from floor to ceiling—a living room
christening of every house
I call home—always as I drink
aged whiskey to the spit
of pitchwood embers, always in Montana,
autumn, the Rockies cross-stitched
in tamarack yellows, and bull elk
bugling their shrill stake
to territory, to harem. The trek
comes back distinct as moon-
silhouetted pine boughs, a rack of antlers
on a ridgetop miles off. It begins with a boy,
with a map he unfolds to trace for me
secret trails to his enchanted land, his trove,
the motherlode of abandoned bone.

One by miraculous one, we found them
almost always rocking on the arch
of main beam, crown tines forked
like hazel dowsing rods peeled white—
widespread fingers gleaming
above green billows of grass
beneath aspen, as if beckoning us
from a hundred paces away. It was easy
to imagine them lightning-
chiseled out of jack pine, a wilderness
wind scattering dry limbs
popped clean from sockets. Some so freshly dropped,
it was easy to believe shamans
laid them in our random paths
seconds ahead of us—to believe grace
a sculpted substance, textured, with heft.

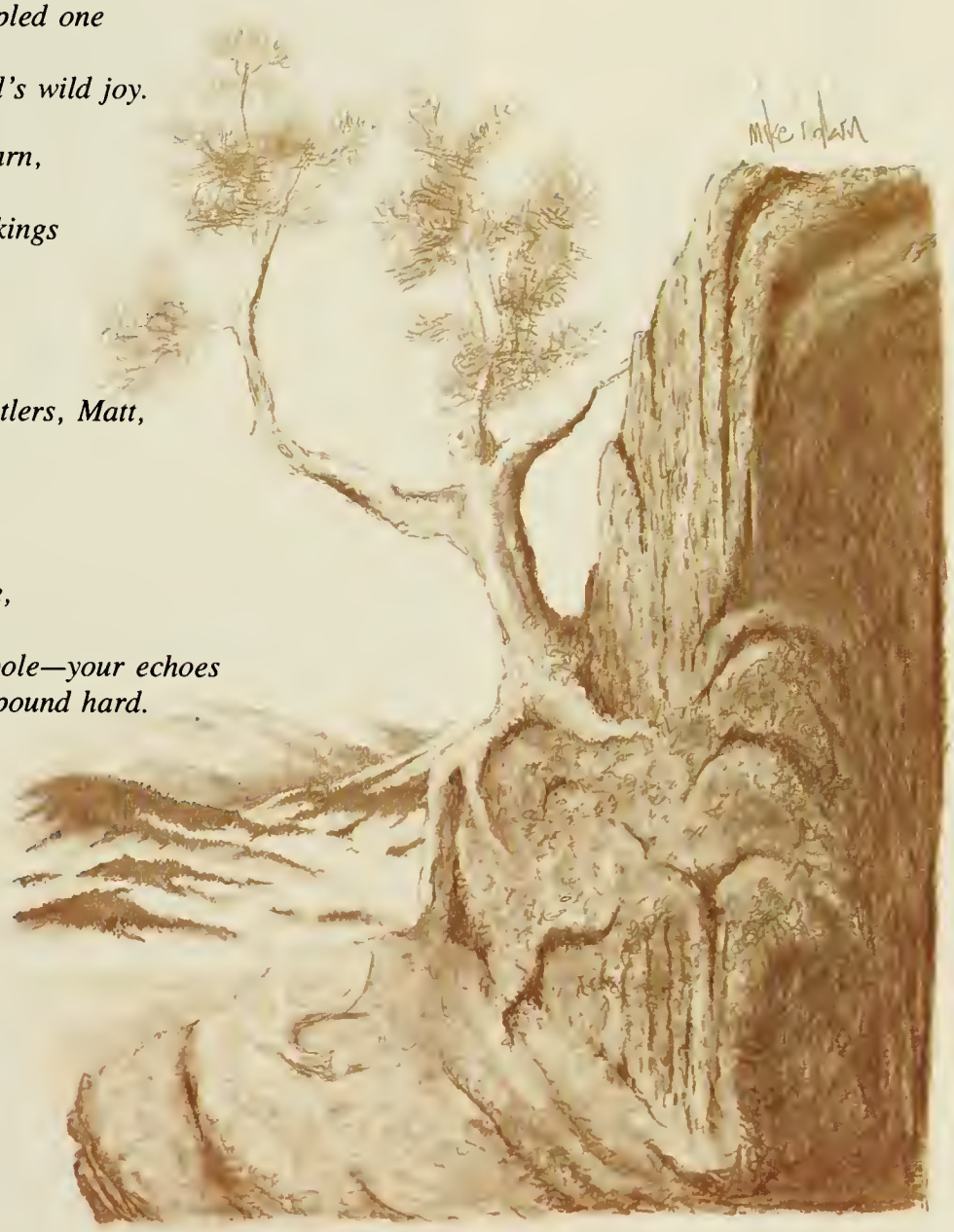
Shoulders galled, collarbones aching, feet blistered
after twelve uphill talused miles,
we unlashed each other from antlered packs
and reveled in the weightlessness that tripped
light-headed leaps over treetops, a floating



those trophy bulls must know
shaking both beams free. I hover often
in that dream, looking down at you
finding a matched set of 6-points
seconds apart—their rosettes, saffron
full moons over August barley,
their scarred tines like scrimshaw
rubbed to an ivory gloss
against sapling pines. You grappled one
gnarled base in each hand
hoisting them with a 12-year-old's wild joy.

Each time I build this tree, I learn,
as a blind child with braille
might learn, the unique interlockings
of a magical language. Tines
clack and rattle into place
like lines we recited along trails
to let bears know the poets
were coming for bone. These antlers, Matt,
having grown branch by branch
more potent. Parts of ourselves
we burnish, then abandon
with hope they'll be gathered
by those who'll keep them whole,
those who'll hear the invisible
clash and clatter through lodgepole—your echoes
making the heart of this hunter pound hard.

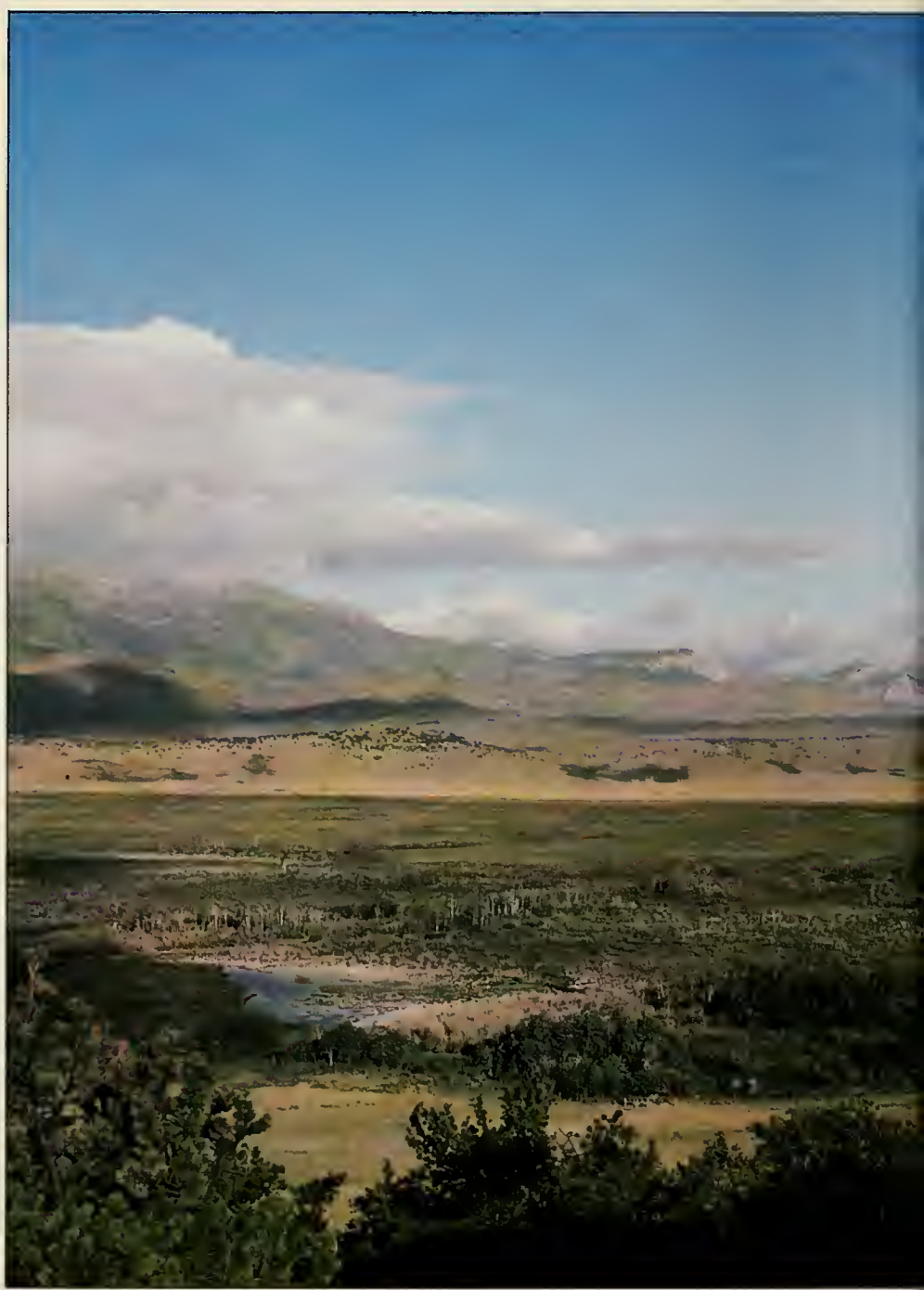
For Matt Hansen—In Memoriam



The Nature Conservancy

DATA, DOLLARS,

by Bob Kiesling



It'll be paradise lost for these grouse if we don't bring some newcomers to the site during the courtship dances," reported zoologist David Genter from a phone booth in northwestern Montana. "Our springtime search turned up too few sharptails to maintain a minimum viable population." It was clear from the urgency in his voice that the Montana Natural Heritage Program director was not just crying wolf. Working with volunteers, Genter exhaustively surveyed the Tobacco Plains area near Eureka, Montana, in April 1987 and concluded that an infusion of additional grouse was essential if this last known Montana population of the Columbian sharp-tailed subspecies was to have a chance at survival.

The plea for action did not fall on deaf ears. Soon after, The Nature Conservancy explained the grim situation to Montana Department of Fish, Wildlife and Parks (DFWP) Director Jim Flynn, who in turn quickly tapped appropriate department personnel to help secure vital federal and state agency clearances to import grouse to the site. Bringing wildlife species across state boundaries provokes concerns about disease, genetic compatibility, the very handling of the wildlife (i.e., who has both expertise and legal authority?) and a host of political concerns, including local public opinion.

Under the best of circumstances, tampering with landowner interests, governmental agencies, and Mother Nature can be harrowing. In this case, the

AND A DEED

DON SIAS

Securing habitat is only half of the job of preserving natural diversity. Once purchased, natural areas must be carefully managed. Carrying out stewardship plans that range from hands-off policies to active manipulation of the landscape via prescribed burning, grazing, and hunting, The Nature Conservancy volunteers and professional staff manage sanctuaries in the best interest of the species and ecosystems targeted for preservation. Sanctuaries range in size from one-half acre to many thousands of acres, such as the Pine Butte Swamp Preserve along Montana's spectacular Rocky Mountain East Front. Excepting special situations in which habitat conservation and human visitation are not compatible, The Nature Conservancy's preserves are open for public study and enjoyment.

usual considerations were compounded by the fact that Canada was the only source of surplus grouse, thus making the grouse immigration an international affair. Henry Kissinger was elsewhere occupied, so the task of shuttle diplomacy fell to The Nature Conservancy (TNC), whose biological interest in the Tobacco Plains area encompassed a population of rare plants and a high-quality grassland community, in addition to the threatened Columbian sharptails. While Genter was busy securing British Columbia's permission to remove some grouse from a Canadian habitat similar to Montana's Tobacco Plains, TNC enlisted the help of Project Lighthawk, a non-profit conservation flight service, to handle the airlift. Grouse experts from Idaho volunteered their trapping equipment and know-how, and several Kootenai National Forest personnel built transport boxes.

Within 24 hours, the grouse had to be trapped, carefully handled and boxed, flown to U.S. Customs inspection in Kalispell, and then flown to the Tobacco Plains site for careful release. Enduring more than 24 hours in captivity would likely stress the fragile birds beyond recovery. Furthermore, the days remaining for the resident birds' courting rituals were nearly gone. Previous attempts to transplant grouse into unoccupied habitats have failed, largely because without the old-timers to educate them in the use of historic dancing grounds (leks), the newcomers simply disperse in confusion and eventually die. Apparently sex education is *de rigueur* for grouse. Rugged individualists these birds are not.

Henry Kissinger would have been pleased with the outcome, however. Extraordinary government and private cooperation resulted in the swift transplanting of 14 Canadian birds. In 1988, a winter bird census showed that most of the newcomers were still around and apparently adjusting well to their new neighborhood, although they still clucked and cooed with a Canadian accent. The Nature Conservancy organized another Operation Grouse Lift to augment the population in April 1988.

DON GODTEL

Occasionally it pays to wing it, and perhaps more of these missions will be necessary before the sharptails dance, *sans souci*, on their historic Montana playground.

Merely adding more grouse, of course, will not lead to species recovery, so The Nature Conservancy is working with area landowners and the DFWP to protect key feeding and wintering areas and other habitat features necessary for the birds' well-being. Quite clearly, the infusion of birds into less than adequate habitat could result in a turkey of a nature preserve. Yet, if it is premature to crow about the success of this effort, it would be equally hard to grouse about any lack of effort on behalf of sharptails. Substantial time, dollars, technology, and cooperation were marshaled to keep the species from parroting the fate of the California condor, the passenger pigeon, or the dusky seaside sparrow. In this and countless other instances, the driving force behind the effort has been The Nature Conservancy.

Never heard of The Nature Conservancy? That shouldn't come as a surprise because TNC is usually so engrossed in

GEORGE WUERTHNER

Working with Montana and British Columbia wildlife authorities, the Kootenai National Forest, and Project Lighthawk, The Nature Conservancy was able to augment the dwindling numbers of western Montana's last known population of Columbian sharp-tailed grouse in the nick of time. Over the past 18 years, this private, non-profit organization has helped state and federal agencies in Montana preserve numerous critical wildlife and recreation areas, such as the Blackfoot River Conservation Corridor pictured above.

the business of land and water conservation that it seldom pauses long enough to point out its track record. Over the past generation, this private, non-profit, scientific, and educational organization has managed to protect over 3 million acres of precious habitat nationwide. It is now the largest owner/manager of nature sanctuaries in the world. With over half a billion dollars tied up in such natural assets and much more to be added by the end of this century, TNC recently has been outspending the federal government's annual budgets for endangered plant and animal preservation.

Well aware of how unpalatable environmental gloom and doom sermons are and equally aware of the backsliding that can occur in endangered species political controversies such as the infamous snail darter/Tellico dam case, TNC long ago decided to devote less time and energy to legislation, lawsuits, and lip-flapping than to direct actions in the marketplace to save habitat. Over 1,000 TNC-owned and managed nature sanctuaries scattered nationwide fairly beam the success of this businesslike strategy. All kinds of efforts are necessary to make preservation of natural diversity a societal priority, but

sometimes the fate of species such as the Columbian sharp-tailed grouse cannot await the more ponderous mechanisms of society to assure their existence. In such instances, deft use of scientific data, dollars, and a deed to the land works wonders.

The businesslike manner in which TNC has pursued the mission of preserving biological diversity prompts occasional barbs from critics who object to its reluctance to engage in adversarial battles. Some look at corporate contributions to TNC's efforts as tainted "conscience" money for instance, but Conservancy personnel are just as quick to respond that "the only problem with such tainted money is that 'tain't enough." Indeed, projections based on the rigorous biological inventories conducted by the Conservancy's information arms, known as Natural Heritage Programs, indicate that more than *$10 billion will be needed to secure protection of the nation's most endangered and threatened species by the year 2000.*

Such a number is staggering—it's greater than Conservancy fund-raising totals to date—and it forces departure from "business as usual" conservation. In the never ending quest for new revenue, TNC's Montana staff now plays the Montana lottery religiously and solicits gifts of stud fees from livestock operators to complement the tried and true gifts of cash, stocks, jewels, art, real estate, etc. which fuel conservation Conservancy-style.

For all its similarities to a successful American corporation, the Conservancy's biggest problem is neither the threat of hostile takeover nor flagging dividends. It lies instead in marketing the notion of the irreplaceable biological and economic values that rare species hold for humankind. Consider the following example: Each year millions of Americans in pursuit of fish and game spend billions of dollars on hunting and fishing licenses and outdoor sporting equipment. Recent DFWP surveys indicate that the typical elk hunter in Montana spends about $285 per elk hunting trip. On a typical stream fishing trip, the aficionado drops about $100 into the Montana economy while dropping a line into the stream. And who isn't aware of the fact that the trout amandine, ragout of rabbit, and wild duck à l'orange that occasionally grace the dinner table sometimes pencil out to $20 per pound of hunting, fishing, and eating enjoyment.

In 1988 in Montana, nearly $3 million of the more than $15 million that will be spent on voluntary fish and game license purchases will be steered toward securing more wildlife habitat and public fishing access in the state. It is indeed impressive what we can do on behalf of wildlife resources near and dear to us. But compare these numbers to the $24,572 generated in 1987 by Montana's voluntary tax checkoff for nongame species, and our wildlife priorities become obvious. While it is relatively easy to draw attention and dollars to the needs of antelope, pheasants, and trout, try stirring comparable excitement over the pygmy rabbit, the common stinkhorn, the bastard toad-flax, or the bony-tailed sucker. Know anybody who would rather sport a painting of a blunt-nosed leopard lizard over the fireplace instead of a handsome elk mount?

Nonetheless, the importance of preserving less well-known or appreciated species should not be underestimated. Chemicals in the reproductive tract of a tiny parasitic wasp hold promise for controlling caterpillars that prey on crops; compounds in the globally endangered rosy-periwinkle have helped cure several types of human cancers. Over half of our medicines come from plants, but we've studied fewer than 10% of Earth's plant species.

Countless examples exist of the economic benefits other species provide humankind. Through our science, we have become smart enough to recognize that both human and planetary health and longevity depend on sustained biological diversity of species. But man's economic and political priorities have yet to reflect a level of concern consistent with the importance of these life forms that hold the answers to our own long-term well-being.

To a skeptic, promoting conservation of biological diversity in the face of lopsided human social priorities might appear as difficult as trying to coax a freight train to take a dirt road. Never one to give up in the face of tough odds, The Nature Conservancy resolutely continues to "save the last of the least and the best of the rest"—not only in the United States,

Why Bother With Furbish Louseworts?

Staring out at the wing of an airplane in which he was flying, renowned conservation biologist Paul Ehrlich noticed thousands of rivets fastening the wing together. The loss of a rivet here and there might not lead to the structural collapse of the wing immediately, but keep removing rivets and, at some point, the entire wing would disintegrate. Analogously, he reasoned, loss of a species here and there might cause no irreparable harm to planet Earth, but the rapid loss of species resulting from human destruction of natural habitats is clearly a fast track to biological collapse.

Although species extinction is a natural phenomenon, human activity has accelerated extinction rates to *1,000 times faster than normal*. While the scientific community recognizes this process as a tragedy in the making, the consequences often are visible only incrementally, and the extinction problem thus seems a less catastrophic threat than nuclear war, for example. Nevertheless, as eminent Harvard biologist E.O. Wilson wrote: "If no country pulls the trigger in a nuclear war, the worst thing that will probably happen—in fact is already well under way—is not energy depletion, economic collapse, conventional war, or even the expansion of totalitarian governments. As tragic as these catastrophes would be for us, they can be repaired within a few generations. The one process now going on, that will take millions of years to correct, is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us."

but lately in Central and South American neo-tropical zones where much of the global species diversity is concentrated. TNC's Latin American efforts do not rely on exporting U.S. capital so much as they focus on data gathering and organization-building skills. The goal is to empower citizens with the vision to recognize the biological treasures in their own backyards and the know-how to build institutions capable of handling the conservation task ahead. Good science, a few lessons from the "school of hard knocks," and goodwill yield good results. And this package seems to make more export sense than does shipping out American capital.

Here in Montana's backyard, The Nature Conservancy debuted in 1970 when it helped the Department of Fish and Game acquire a 26,000-acre ranch between Helena and Great Falls now known as the Beartooth Wildlife Management Area. The Mount Haggin Wildlife Management Area, Wild Horse Island State Park, the Poindexter Slough Fishing Access Site near Dillon, the Blackfoot River Conservation Corridor, the Cracker Lake Inholding in Glacier National Park, and numerous other cooperative efforts with state or federal agencies over the past 18 years now protect nearly 200,000 acres of treasured wildlife habitat, almost all accessible for public enjoyment.

Applying its real estate savvy on behalf of public agency priorities is a well-established and ongoing role for the Conservancy, but TNC, nonetheless, spends most of its time identifying and saving the rarest and the best remaining biological features of the state. In 1985, TNC launched the most ambitious private effort ever to save some of the best of the "last of the big-time splendors" in celebration of the state's 1989 Centennial. Known as the "Montana Centennial Conservation Project," the goal is to put a few choice patches of Montana's prairies, mountains, and wetlands aside for present and future generations to study and enjoy. Hmmm...probably ought to save a few cricks and gullies, also. Get ready now. In coming months you just might be thrown a direct mail, radio, or television pitch that tempts you with the opportunity to help drive TNC home on this project. When that pitch comes, swing for the bleachers.■

BOOK REVIEWS

NAVIGATIONS, by Ted Kerasote, Stackpole Books, P.O. Box 1831, Harrisburg, PA 17105; 1986, 187 pages, $16.95 hard cover.

Readers of outdoor publications will recognize the Ted Kerasote byline. He carries masthead credit as camping editor of *Sports Afield*, but the subjects he covers range far beyond how to pitch your tent. In recent issues of that publication, he's delved into the mysteries of the perfect cup of coffee, and he's also suggested the correct way to cut your toenails. This diversity bespeaks curiosity, ongoing wonder at the world around him. Both his curiosity and his sense of wonder are apparent in "Navigations."

In a sense, it's a travel story—"South," "North," and "Home"—that spans 12 years. In "South," Kerasote fishes for snook in Costa Rica, climbs a bit of crumbling volcanic stone at the tip of South America that is the highest point in the Western Hemisphere, and fly-fishes Argentina's Chimehuin River.

In the "North" section, he explores "Hill Music," which turns out to be the tinkling sound made by the ends of the laces of his running shoes, blown by the wind, chiming against the aluminum frame of his backpack to which they are tied. He explores bigger issues, such as caribou and the difficulty of balancing the needs of the animals, Native hunters, state governments (Alaska), territorial governments (the Yukon), to say nothing of the federal governments of the United States and Canada. He's good at pithy quotes, the kind you stop and read a second time, or maybe a third. The kind that make you think. In the caribou chapter, as he is introducing the various elements of the controversy, he notes, "Everyone has a war." In "A Char Heavy With Roe," he describes a four-week hike into silence: "Up here in the Arctic National Wildlife Refuge (or Arctic People Refuge might be just as good a name), there's enough country to walk in. There's no *Time* magazine; there's no 'Today' show; gentility went by the boards a fortnight ago. We get hungry in old, old ways." He also photographs bighorn sheep, finds a delectable patch of wild strawberries, and escorts a dragonfly to safety on the bow of his canoe.

The trip "Home" is a painful one, and you have the sense that the writing is an emotional "cleaning house" for him—the setting aright of a topsy-turvy world. He opens his mental rucksack, digs down to the bottom, and spreads out the contents, piece by piece. This navigation, too, requires a map, but it's of a different sort, with vague and difficult directions.

You may have read some of the pieces previously; they appeared in *Alaska, Audubon, Cross-Country Skier, Mountain Gazette*, and, of course, *Sports Afield*. I read a review of "Navigations" in another publication, and the pithy quote that hooked me goes like this: "Each of us is given some seventy years, a decent amount of time and such a niggardly small gift when you have eyes to see the gifts you must leave. In that time, you shouldn't be afraid to take a year or two or even more to do something not in the straight path you originally chose. You shouldn't be afraid to watch the slow turnings of stars and clouds and strange peoples, for although family, country, and abiding loves will never afterwards be holy, they will become tender and subtle in unimagined ways."

It's much more than a travelogue spanning 12 years in a man's life; it's a book about navigating through life.-*Kay Morton Ellerhoff*